

BULLETIN  
OF THE  
AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXVIII

1906.

No. 8

THE CLASSIFICATION OF CLIMATES: II.

BY

ROBERT DEC. WARD,  
Harvard University.

SYNOPSIS.

Supan's Climatic Provinces.—Köppen's Classification of Climates.—Hult's Classification of Climates.—Ravenstein's Hygrothermal Types.—Classification of Rainfall Systems.—Summary and Conclusions.

*Supan's Climatic Provinces.*—The ordinary classification into continental, marine, and mountain climates is too general. Some scheme of classification is needed in which the geographical factor plays an important part, and which recognizes the types of climate, possessing common characteristics of temperature, rainfall, and winds, which occur over areas having similar topographic conditions. A fairly simple scheme of this kind has been suggested by Supan, who recognizes thirty-five so-called climatic provinces,\* but any such rigid subdivision is obviously susceptible of almost infinite modification. Twenty-one of these provinces are in the Eastern hemisphere, including Polynesia; twelve are in the Western, and two in the polar zones. The descriptions of these provinces are as follows:†

1. Arctic Province. This coincides with the north polar cold cap, the area wherein the mean temperature of the warmest summer month is never over 50° F., and within which trees do not grow.

2. West European Province. Mild winters, owing to influence of the westerly winds and Gulf Stream. Yearly temperature range

\* A. Supan: *Grundsätze der physischen Erdkunde*, 3d Ed., Leipzig, 1903, 211-214.

† Free translation of original, following Bartholomew's *Atlas of Meteorology*, p. 7.

under 59° F. (15° C.). Plentiful rainfall, fairly well distributed throughout the year, but varying in quantity owing to great diversity of land contours. The climatic conditions often vary in short distances, and hence the region can be divided into many subdivisions.

3. East European Province. Here the evidences of a land climate begin to be observed; but as most of the region is a plain, differences depend mainly on latitude. The rainfall is smaller than in Province 2, and gradually diminishes towards the south-east, and has a marked summer maximum.

4. West Siberian Province. This is separated from 3 by the limit of the positive annual isanomalous lines, which practically coincides with the Urals. The characteristic peculiarities of 3 are found here greatly emphasized, and the greater variability of temperature is to be noted.

5. East Siberian Province. A gradual rising of the ground is found east of the Yenisei, with low plains only along the rivers. The winter cold pole is here, and the yearly range of temperature is a maximum. As a rule, the rainfall is low.

6. Kamchatkan Province. The sea diminishes the temperature extremes noted in Province 5, and much rain falls.

7. Sino-Japanese Province. On the continent relatively well-marked winter cold, and strong periodical rains. In Japan these peculiarities are less extreme.

8. Asiatic Mountain and Plateau Province. This includes all the lofty plateaux bounded by mountain ranges, which shield it on every side, and so render it very dry. The great height makes the winter temperature severe; but the summer heat is great, owing to the continental position. The daily as well as the yearly range of temperature is very marked.

9. Aral Province. Dry low-lying plain, with the greatest rainfall in the north in summer, and in the south in winter. The plains of western Turkestan have severe winters and very hot summers.

10. Indus Province. A plain remarkable for great dryness and heat.

11. Mediterranean Province. Very varied in climate, owing to its great irregularity of outline, both horizontal and vertical. Mild, except on high plateaux. Winter rains.

12. Saharan Province. Reaches to Mesopotamia. Region of dry north winds, and probably the one receiving least rain. Its continental position and lack of vegetation increase the heat of

summer extraordinarily; both annual and daily ranges of temperature are considerable.

13. Tropical African Province. Owing to the height of the central plateau the heat is less intense, but it is very great on the narrow coastal plains. Tropical rains decreasing towards the west.

14. Kalahari Province. Includes all the almost rainless region of Southwest Africa.

15. Cape Province. Sub-tropical.

16. Indo-Australian Monsoon Province. Strong periodical rains are brought with the southwest and northwest monsoons, except at a few places in the archipelago. The temperature is fairly uniform, despite the great extent of the province, and the yearly range is very small.

17. Inner Australian Province. With great extremes of temperature. Irregular and rare rains.

18. Southwest Australian Province. Sub-tropical.

19. East Australian Province. It extends to the water-parting and includes the southeast coast and Tasmania. Plentiful and fairly regular rains. Moderate range of temperature.

20. New Zealand Province. Probably includes the small neighbouring islands. Mild climate, with fairly regular rains.

21. Tropical Polynesian Province. Tropical climate, ameliorated by the ocean, so that mild summer weather prevails throughout the year. On the loftier islands the rain is abundant, and has a tropical periodicity.

22. Hawaiian Province. Also a mild climate, but with sub-tropical rains.

23. Hudson (North Canadian) Province. Great extremes of temperature and little precipitation.

24. Northwest American Coastal Province. Mild, equable, rainy climate.

25. Californian Province. Relatively cool, especially in summer. Marked sub-tropical rainy seasons.

26. North American Mountain and Plateau Province. Great yearly and daily ranges. Dry.

27. Atlantic (East North American) Province. Great contrast in temperature conditions of north and south in winter. Extreme climate even on the coast. Plentiful rains, evenly distributed throughout the year. Great variability.

28. West Indian Province. This also includes the southern rim of North America. Equable temperature. Rain at all seasons, but with a marked summer maximum.

29. Tropical Cordilleran Province. On the interior plateau perpetual spring, owing to considerable height above sea-level. In Mexico and Central America marked zenithal rains; in South America more regular precipitation.

30. South American Tropical Province. Little that is certain is known about this province, which includes mountainous regions and plains, and ought, therefore, to possess considerable variety of climate.

31. Peruvian Province. This province extends as far south as  $30^{\circ}$  S., and so includes the northern part of Chile. Abnormally cool. Rainless.

32. North Chilean Province. Sub-tropical.

33. South Chilean Province. Equable temperatures, with cool summers.\* Extraordinarily rainy.

34. Pampa Province. Range of temperature fairly large, especially in the north. Rain not plentiful.

35. Antarctic Province. Resembles the Arctic, so far as can at present be determined, in winter cold, but differs in having a very low summer temperature and a very regular distribution of pressure and winds.

Fig. 1 shows the geographical distribution of these climatic provinces.\*

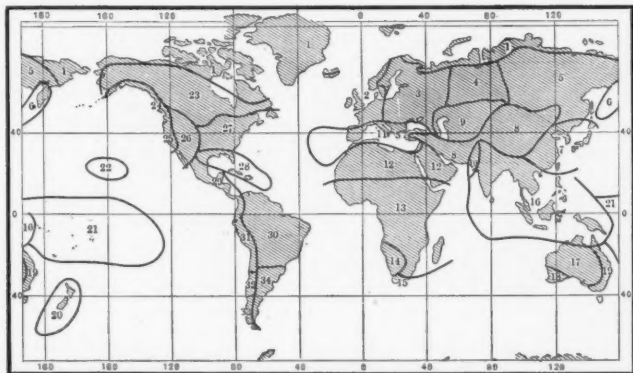


FIG. 1.—SUPAN'S CLIMATIC PROVINCES.

*Köppen's Classification of Climates.*†—An interesting classification of climates, from a botanical standpoint, is that proposed by

\* From A. Supan: *Grundzüge der physischen Erdkunde*, Leipzig, 1903. Pl. XIV. The provinces are numbered somewhat differently in the original map.

† W. Köppen: *Versuch einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt*. Hettner's Geogr. Zeitschr., VI, Nov.-Dec., 1900. Reprinted. Pp. 458. Leipzig, Teubner. Abstr. in *Met. Zeitschr.*, XVIII, 1901, 106-120.







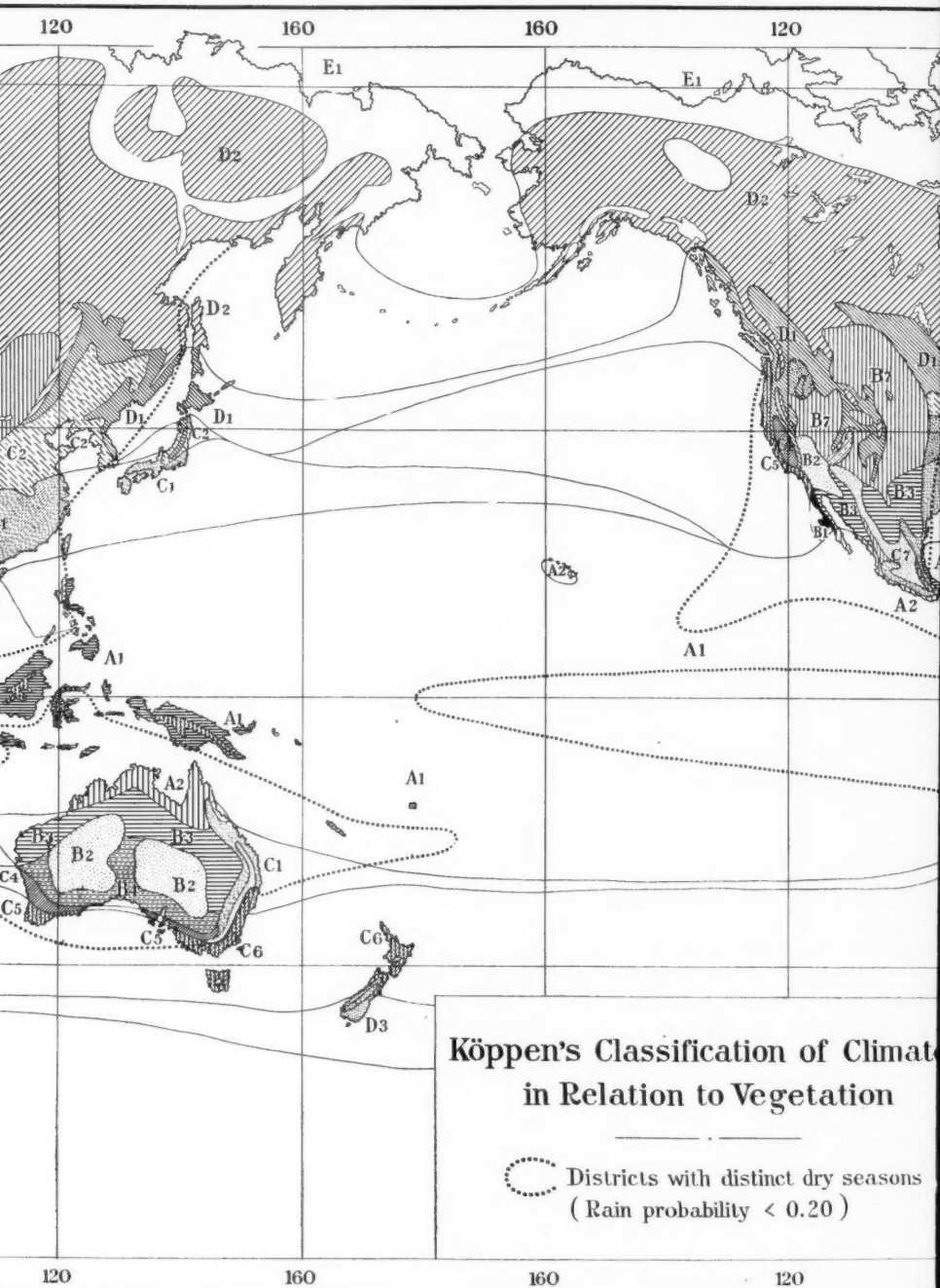


PLATE I.

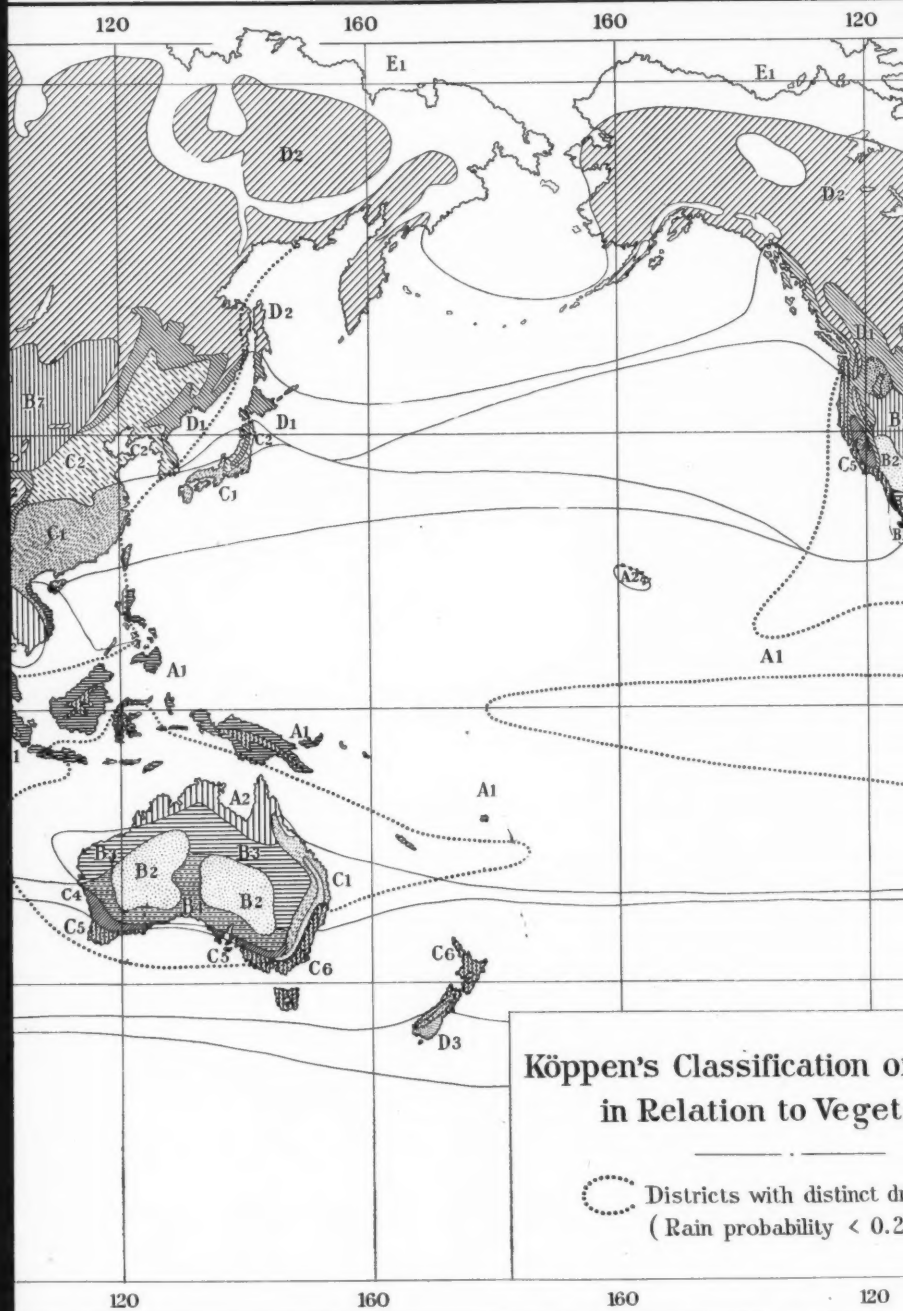
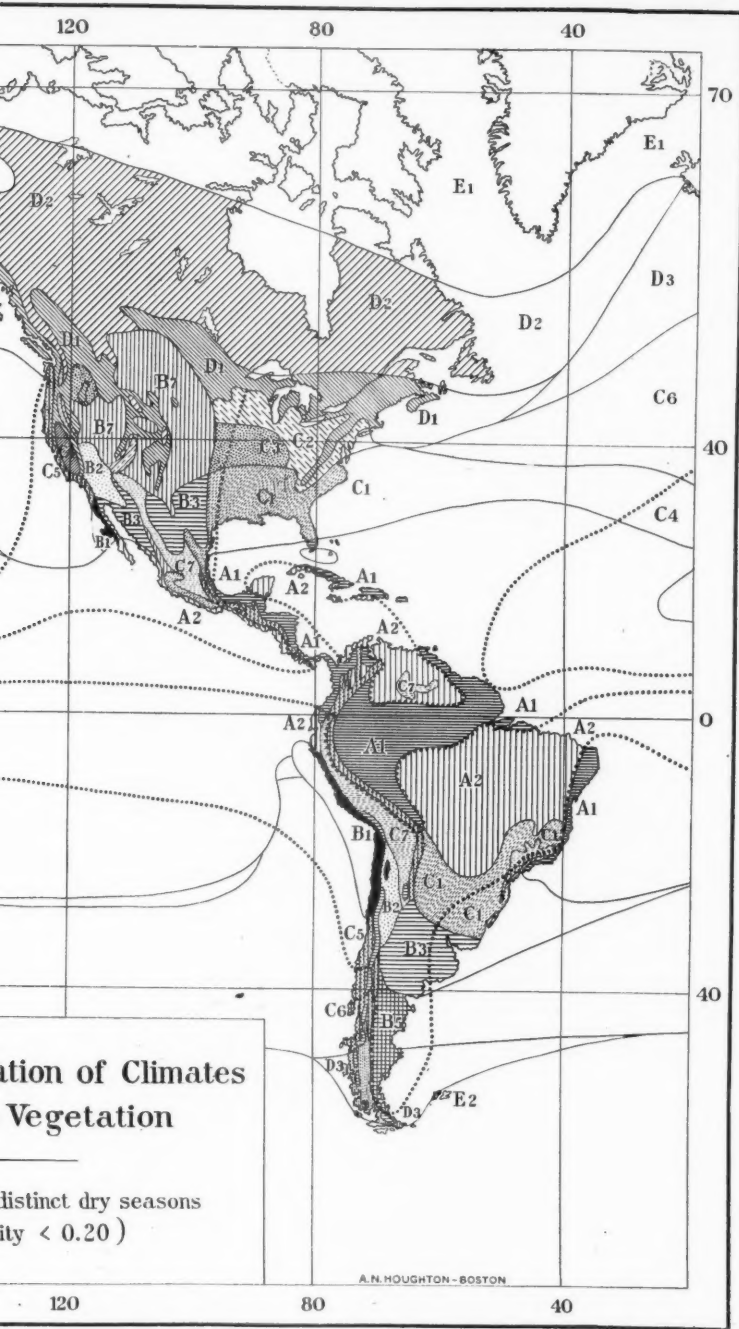


PLATE I.



a  
i  
c  
c  
M  
v  
M  
v  
c  
t  
t  
c  
T  
r  
r  
v  
c  
a  
o  
w  
i  
n  
n  
o  
(  
th  
c  
fi  
tu  
es  
co  
—

Köppen. This rests upon certain critical values of the temperature and rainfall of the warmest or coldest, or of the wettest and driest month. The plant classification proposed by A. de Candolle\* in 1874, and later adopted by Drude,† is accepted. This is a division into five principal biological groups under the control of temperature and moisture, as follows:

A. *Megatherms*: plants which need continuously high temperature without much annual range, and also abundant moisture. There is no cool season; the temperature of the coolest month is over  $64.5^{\circ}$  ( $18^{\circ}$  C.), and there is at least one month of heavy rain. When there are marked dry seasons the principal one comes in winter and spring. In parts of this belt there are two rainy seasons. In this belt are found the lofty tropical forests intertwined with vines and creepers—sago, betel, pepper, cacao, bread fruit, baobab, coffee, sugar cane, banana, ginger, and so on.

B. *Xerophytes*: plants which love dryness and need high temperatures, at least for a short season. These are found in tropical districts which have a long dry season, and in the steppes and deserts of the tropics and of the warmer parts of the temperate zones. They are adapted in various ways for life in a dry climate; they rest during the dry time, and, in extreme cases, where rain may not fall for years, they survive as seeds. The vegetation varies with the soil. In this group we find the date, mesquite, acacia, cactus, agave, and similar plants.

C. *Mesotherms*: need moderate heat ( $59^{\circ}$ – $68^{\circ}$ ) and a moderate amount of moisture; some require high summer temperatures; others shun low winter temperatures; others shun the dryness which often accompanies high summer temperatures. These plants inhabit latitudes between  $22^{\circ}$  and  $45^{\circ}$  N. or  $40^{\circ}$  S., as long as the moisture continues sufficient. There is a cool season—coldest month below  $64.5^{\circ}$  ( $18^{\circ}$  C.)—and a hot summer,—warmest month over  $72^{\circ}$  ( $22^{\circ}$  C.),—or a mild winter—coldest month over  $43^{\circ}$  ( $6^{\circ}$  C.),—or both. The classic Mediterranean climate is found in this belt. The mesotherm belt contains the tea, maté, rice, cotton, magnolia, hickory, arbor vitæ, hemlock, wheat, corn, olive, fig, grape, heath, cinchona, etc.

D. *Mikrotherms*: need less heat, lower mean annual temperature, cooler and shorter summers, and colder winters. The warmest month is at least  $50^{\circ}$  ( $10^{\circ}$  C.) and not over  $72^{\circ}$  ( $22^{\circ}$  C.); the coldest is below  $43^{\circ}$  ( $6^{\circ}$  C.), with at least an occasional snow-cover

\* A. de Candolle: Arch. Sci. Bibl. univ. de Genève, 1874.

† O. Drude: *Pflanzengeographie*, Stuttgart, 1890, p. 111.



in winter and sufficient rainfall in the warmer season. Evergreen and deciduous forests, grains, and in the warmer portions fruit and corn are found.

*E. Hekistotherms*: plants of the Arctic zone, beyond the limits of tree growth and of the zone of scrubby Antarctic vegetation. These need the least heat. Mosses, lichens, and similar lowly forms are typical.

A simple scheme of distribution of these five groups of plants may first be developed with reference to an ideal continent, stretching from pole to pole, with oceans on both sides and without mountains (Fig. 2).<sup>\*</sup> Here *a a* is the western and *b b* the eastern coast.

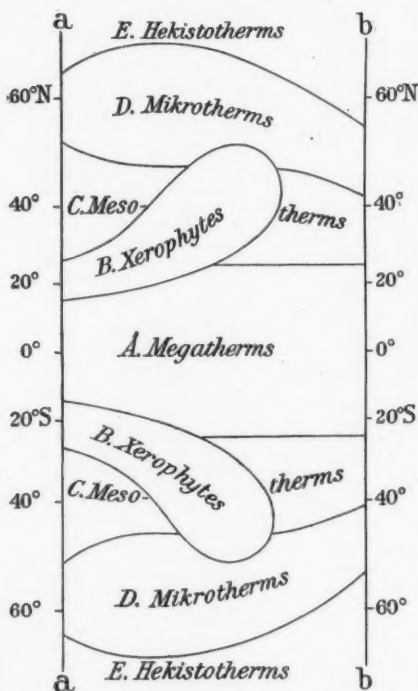


FIG. 2.—GENERAL DISTRIBUTION OF PLANT ZONES.

The approximate latitudes are given at the margins. The groups of de Candolle's system are arranged as shown, if the xerophytes are limited to the deserts and steppes and if those woody plants of the megatherm and mesotherm zones which are adapted to a dry climate are included within these zones. The typical zonal arrangement is interrupted in latitudes 20° to 50° by the fact that the arid district of the xerophytes (B) is wedged in on the west coast between A and C. Farther east zone B broadens poleward, cuts through the middle of the mesotherm zone, and usually ends without reaching the east coast.

The five principal types are further subdivided until the whole number of climates reaches twenty-four. The special conditions which characterize each climate are carefully determined, and each

<sup>\*</sup> After Köppen, *ibid.*

sub-climate is named after one of its characteristic plants or animals; or after some distinctive meteorological phenomenon; or, again, after the general character of its vegetation. Fig. 3 gives the limits of the different sub-climates, and also the characteristic conditions of temperature and precipitation.\* Fig. 4 gives the

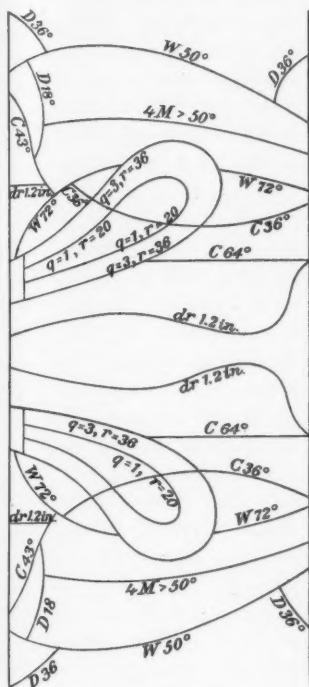


FIG. 3.—SCHEME OF CLIMATES AT SEA LEVEL.

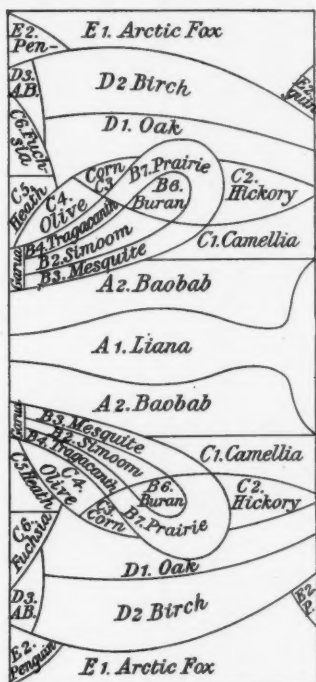


FIG. 4.—NAMES OF CLIMATES AT SEA LEVEL.

scheme of the sub-climates for the lowlands, with their names. Four climates which do not occur at sea-level are here lacking (C7, E3, E4, F).† The vertical distribution of these climates, much simplified, is shown in Fig. 5. The descent of the climatic strata from equator to higher latitudes is shown on the right for the con-

\* Figures are degrees Fahr. C=coldest month, W=warmest month, 4 M=4 months, dr 1.2 in.=driest month rainfall 1.2 inches, D 18° and D 36°=difference between extreme months 18° and 36°, q=quotient obtained by dividing the amount of rainfall in the wettest month (in mm.), by the maximum vapour tension (in mm.) at the mean temperature of the same month, an expression which combines the effect of rainfall and evaporating power, r=rain probability of rainiest month.

†C7, High savanna climate; E3, Yak, or Pamir climate; E4, Chamois or High Alpine Climate; F, perpetual frost, without life.

tinental and on the left for the marine type, as far as about latitude  $57^\circ$ . Climates  $C_1$  to  $C_4$ , and  $D_1$  and  $D_2$ , have large temperature ranges, and are therefore lacking at the equator and on the ocean;

while  $C_5$  to  $C_7$ , and  $D_3$ , have small ranges, and are not found on the continents of higher latitudes. The general control of pressure, winds and ocean currents over the climatic types is shown in the two following ideal diagrams, in which the two vertical lines indicate the west and east coasts of the ideal continent, and the area included reaches to the middle of the adjacent ideal oceans. The line  $0^\circ-0^\circ$  is the equator (Figs. 6 and 7). The short arrows give the wind direction 500-1000 m. above the surface; calms are represented by the sign  $\odot$ ; the long broken arrows indicate the prevailing surface ocean currents. At *aa* there is a rise of cold water from beneath the surface of the ocean. The curving lines are sea-level isobars; the lower pressures are shaded. The letters and boundaries drawn in short slanting lines in Fig. 7 indicate the climatic districts of Fig. 2. Fig. 6 is similar to Fig. 7 as far as these climatic districts are concerned. Therefore the letters and boundaries are omitted. Plate I. shows the geographical distribution of the climatic types and subtypes.

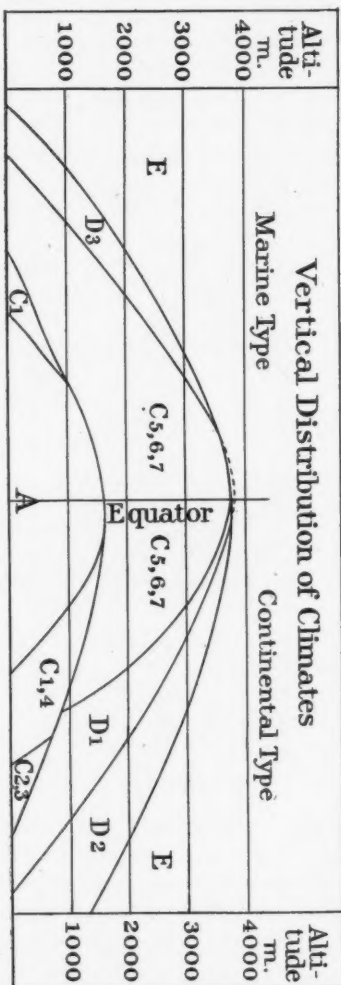
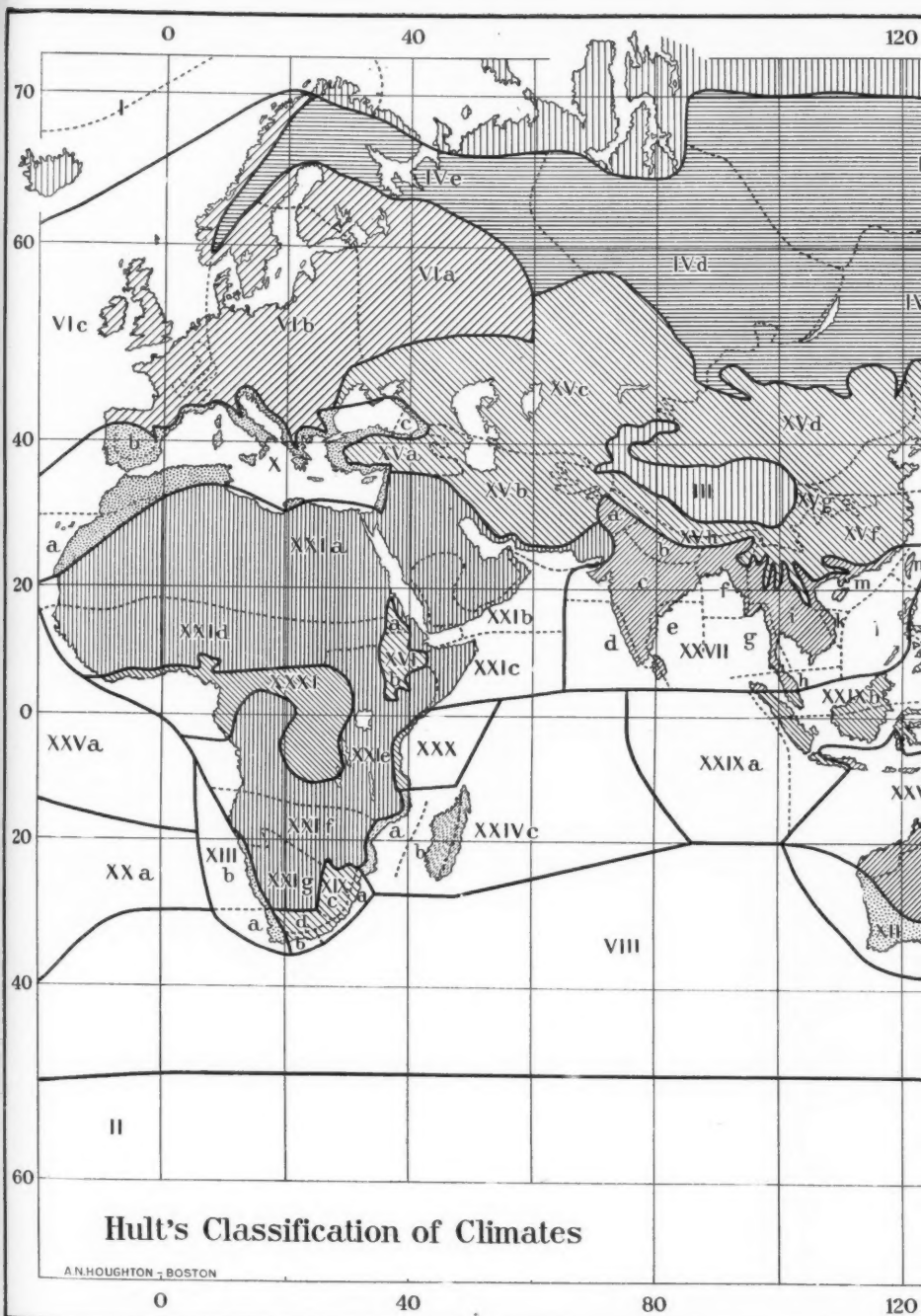


FIG. 5.—VERTICAL DISTRIBUTION OF CLIMATES.

Hult's Classification of Climates.\*—Another scheme of classifica-

\* R. Hult: *Jorden's Klimatområden. Försk till en indelning af Jordytan efter Klimatiska Grunder*. Vetenskap. Meddelanden af Geografiska Föreningen i Finland. I. 1892-93. Helsingfors, 1892-93, pp. 140-201. Chart XVI. *Rev. Met. Zeitschr.*, XII, 1895 (48)





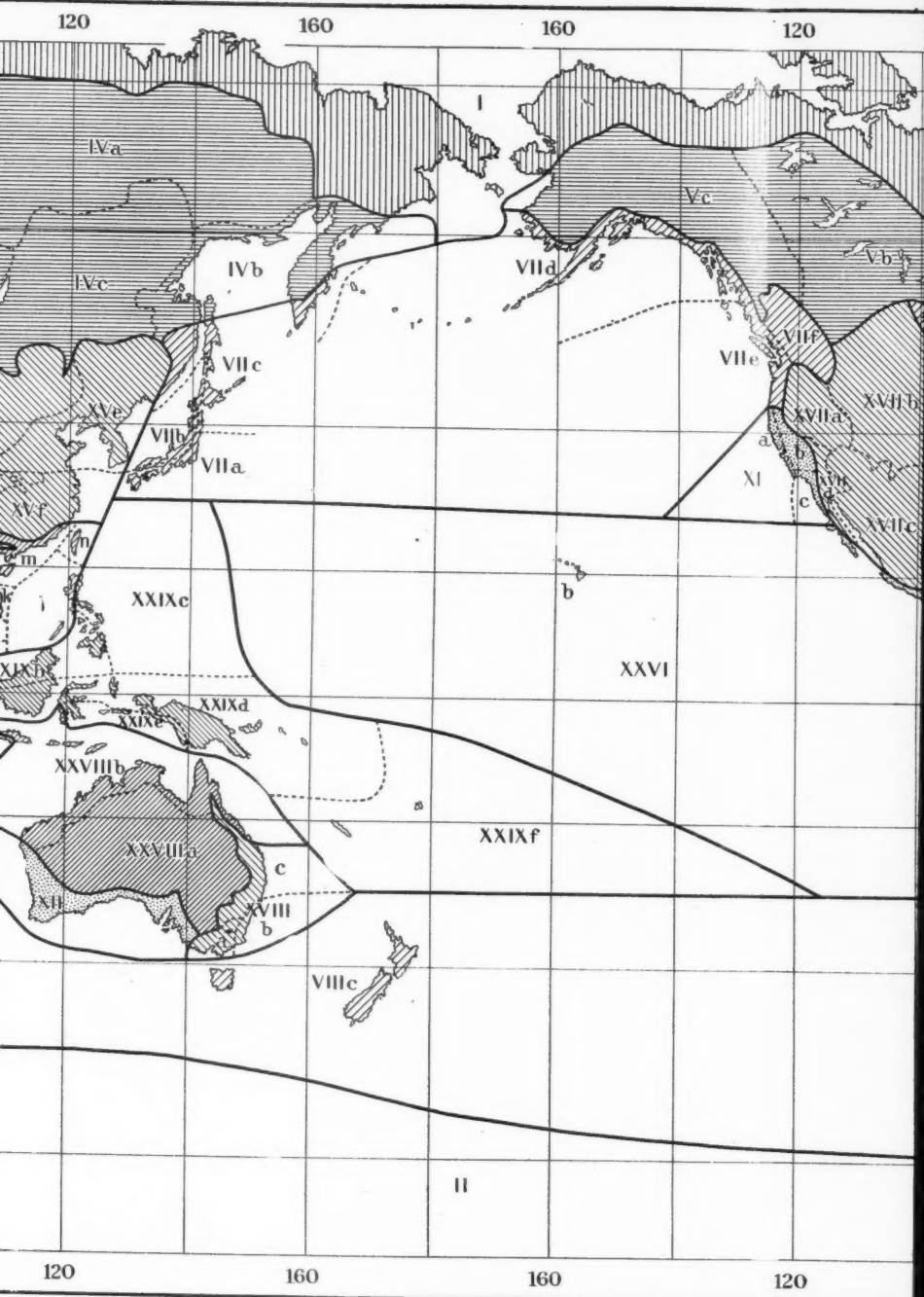


PLATE II.

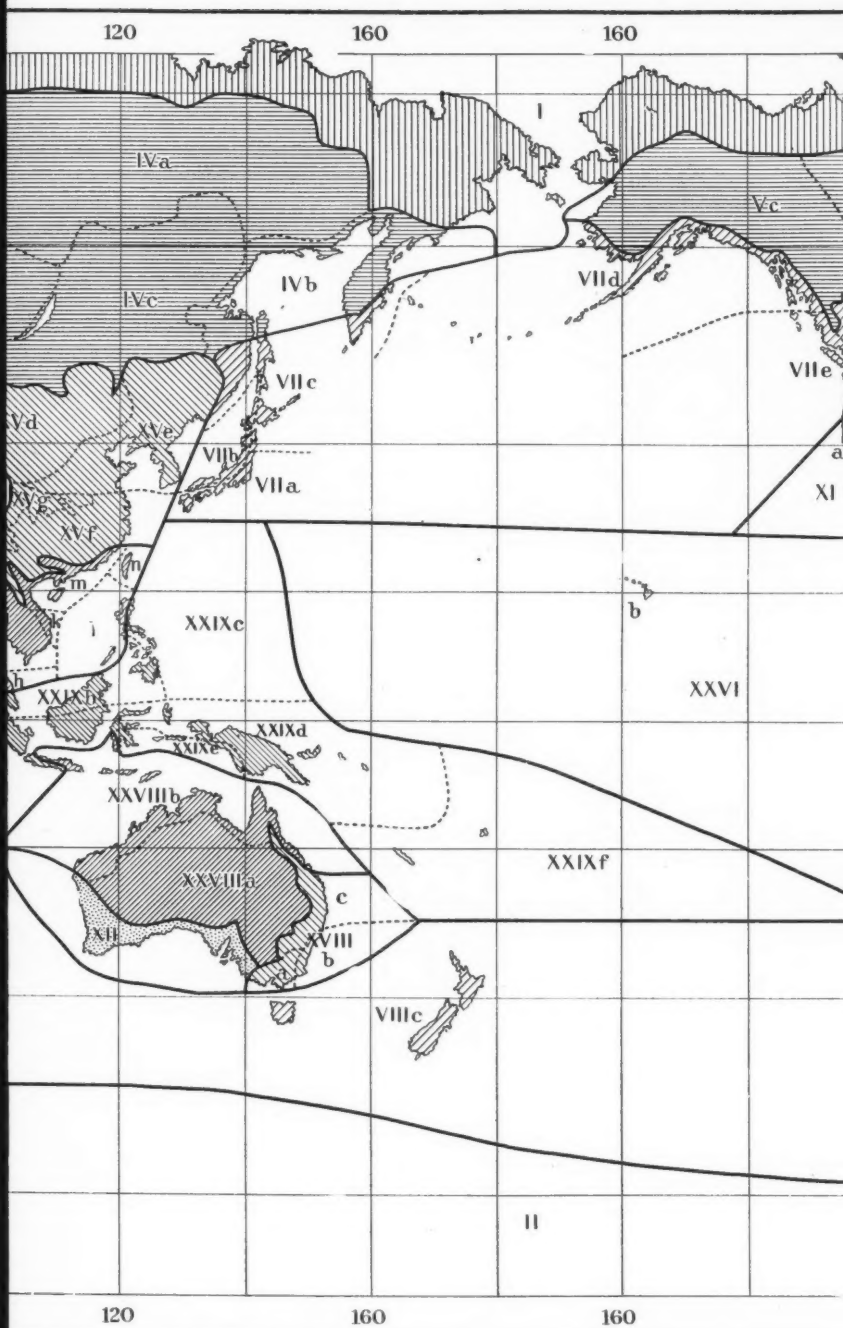
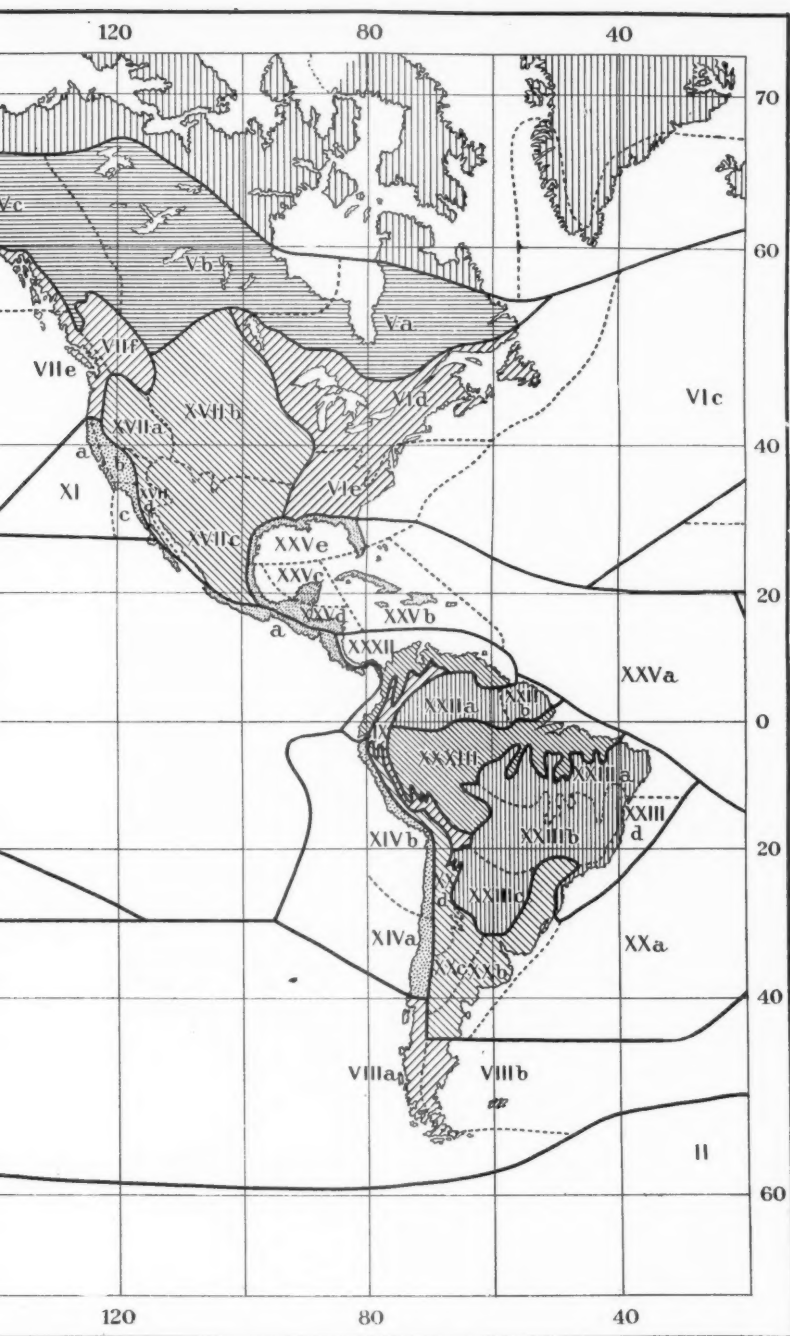


PLATE II.





tion  
diff  
tric  
lev  
dis  
dis  
ann  
cha  
Th

the  
tat  
cli  
dre  
sm  
me  
 $\beta$ .  
B.

tion, proposed by Hult, embraces three large divisions based upon differences in mean annual temperatures as follows: A. Cold districts, whose mean annual temperature (without reduction to sea-level) is below, or but slightly above, freezing. B. Temperate districts, with mean annual temperature of  $32^{\circ}$  to  $68^{\circ}$  F. C. Warm districts, with mean annual temperatures over  $50^{\circ}$ , and small annual range of temperature, the distribution of the rains and the changes in the winds being the chief characteristics of the seasons. These three main divisions are further subdivided on the basis of

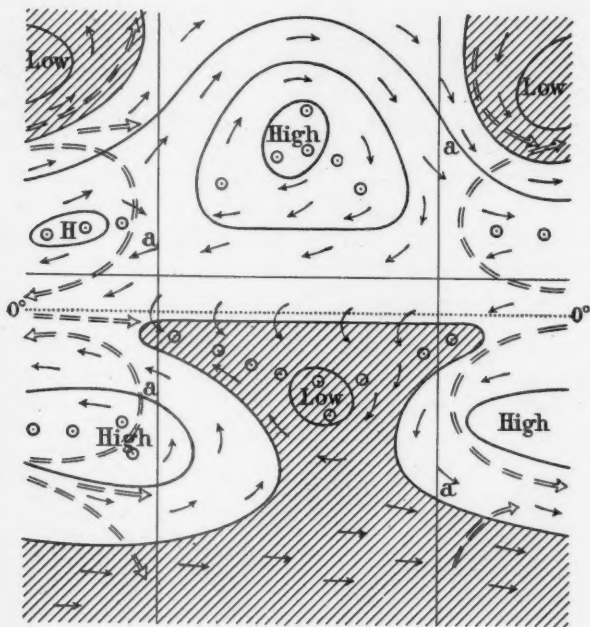


FIG. 6.—PRESSURE AND WINDS IN JANUARY.

their seasonal characteristics of temperature, of winds or of precipitation into nine smaller districts, including thirty-three different climatic kingdoms. These latter are again subdivided into one hundred and three smaller provinces. The subdivisions, omitting the smaller provinces, are as follows: A. *a*. Districts with cold summers (warmest month  $\leq 50^{\circ}$ ): I, Arctic; II, Antarctic; III, Tibet.  *$\beta$* . Districts with warm summers: IV, Siberian; V, Hudson's Bay. B. *a*. Districts of prevailing westerly winds, with precipitation in

all months and many cyclones: VI, Gulf Stream; VII, Kuro Siwo; VIII, South Pacific; IX, Andean.  $\beta$ . Districts with variable winds, winter rains and dry midsummers: X, Mediterranean; XI, Californian; XII, Southwest Australian; XIII, Benguela Current; XIV, Humboldt Current.  $\gamma$ . Districts with weak and irregular winds, summer rains, and with the principal dry season in winter: XV, Central Asiatic; XVI, Habesch; XVII, Rocky Mountain; XVIII, Blue Mountain; XIX, Orange Free State; XX, Pampa. C. a. Districts with one or two solstitial rainy seasons and with the

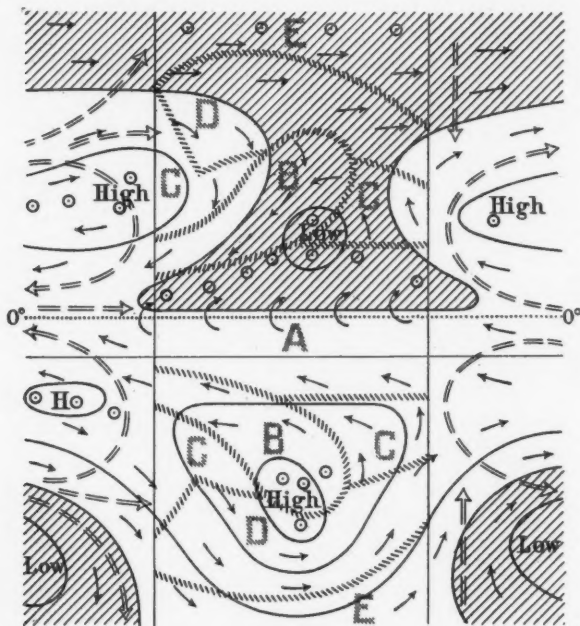


FIG. 7.—PRESSURE AND WINDS IN JULY.

trades weak or interrupted by local monsoons: XXI, African; XXII, Llanos; XXIII, Brazilian.  $\beta$ . Districts with normal trades and trade rains: XXIV, Madagascan; XXV, Caribbean; XXVI, Pacific.  $\gamma$ . Monsoon districts: XXVII, Indian; XXVIII, North Australian.  $\delta$ . Districts with abundant rainfall in all months (doldrum rains): XXIX, East Indian; XXX, Suahelian; XXXI, Guinean; XXXII, Colombian; XXXIII, Selvan. The distribution of these types is shown in Plate II.\*

\* From Hult, *vide supra*. On the chart here reproduced the smaller provinces are not shown.

*Ravenstein's Hygrothermal Types.*\*—Recognizing the importance of relative humidity as a climatic factor in its influence upon life, upon agriculture and upon industry, and basing his grouping of climates upon certain relations between temperature and relative humidity, Ravenstein proposes a subdivision of the earth's surface into sixteen *hygrothermal* climatic types. The general characteristics and examples of these types are as follows:

1. Hot ( $73^{\circ}$  and over) and very damp (humidity 81% or more): Batavia, Cameroons, Mombasa.
2. Hot and moderately damp (66–80%): Havana, Calcutta.
3. Hot and dry (51–65%): Bagdad, Lahore, Khartum.
4. Hot and very dry (50% or less): Disa, Wadi Halfa, Kuka.
5. Warm ( $58^{\circ}$  to  $72^{\circ}$ ) and very damp: Walvisch Bay, Arica.
6. Warm and moderately damp: Lisbon, Rome, Damascus, Tokio, New Orleans.
7. Warm and dry: Cairo, Algiers, Kimberley.
8. Warm and very dry: Mexico, Teheran.
9. Cool ( $33^{\circ}$  to  $57^{\circ}$ ) and very damp: Greenwich, Cochabamba.
10. Cool and moderately damp: Vienna, Melbourne, Toronto, Chicago.
11. Cool and dry: Tashkent, Simla, Cheyenne.
12. Cool and very dry: Yarkand, Denver.
13. Cold ( $32^{\circ}$  or less) and very damp: Ben Nevis, Sagastyr, Godthaab.
14. Cold and moderately damp: Tomsk, Pike's Peak, Polaris House.
15. Cold and dry:
16. Cold and very dry: Pamir.

*Classification of Rainfall Systems.*—The seasonal occurrence of rainfall has suggested a classification of the rainfall systems of the world into types. While these schemes are useful in climatological study, they are hardly to be considered as classifications of climate. Mühry† gave a rigid scheme of rainfall types in six belts for each hemisphere, these belts being divided by latitude lines, and Köppen has prepared a useful map of the hyetal regions of the world based on the seasonal distribution of rainfall types. ‡

\*E. G. Ravenstein: *The Geographic Distribution of Relative Humidity*. Rept. Brit. Ass. Adv. Sci., 1900, 817–818.

†A. Mühry: *Klimatographische Uebersicht der Erde*, Leipzig and Heidelberg, 1862, 741–744. Also: *Allgemeine geographische Meteorologie*, 1860, 145, and note 23, 199. Containing chart, as well as the scheme of rainfall types.

‡See *Atlas of Meteorology*, Plate 19.

*Summary and Conclusions.*—The broad classification of climates into the three general groups of marine, continental, and mountain, with the subordinate divisions of desert, littoral, and monsoon, is convenient for purposes of summarizing the interaction of the climatic elements under the controls of land, water, and altitude. But in any detailed study some scheme of classification is needed in which similar climates in different parts of the world are grouped together, and in which their geographic distribution receives particular consideration. It is obvious from the preceding paragraphs that an almost infinite number of classifications might be proposed; for we may take as the basis of subdivision either the special conditions of one climatic element, as, for example, the same mean annual temperature, or mean annual range of temperature, or the same rainfall, or rainy seasons, or humidity, and so on. Or again, similar conditions of the combination of two or more elements of climate may be made the basis of classification. Or we may take a botanical or a zoological basis. Of the classifications which have been proposed, special reference is here made to those of Supan, Köppen, and Hult. That of Supan, taken as a whole, gives a rational, simple, and satisfactory scheme of grouping, whose frequent use in climatic descriptions would tend toward system, simplicity, and facility of comparison. It emphasizes the essentials of each climate, and serves to impress these essentials upon the mind by means of the compact, well-considered verbal summary which is given in the case of each province described. Obviously, no classification of climates which is at all complete can approach the simplicity of the ordinary classification of the zones.

Köppen's admirable scheme of subdividing climates from the botanical point of view is distinctly rather for the use of students of plant geography than of general climatology. The present limits of the different climates in Köppen's map will doubtless need to be changed in several cases, as more detailed botanical studies throw further light on the geographical distribution of different plants, and no rigid delimitation of plant zones is ever satisfactory to everyone. But Köppen's classification has the great merit of recognizing the existing differences of climate between east and west coasts; and between coasts and interiors. The co-ordination of districts of vegetation and of climate, which this scheme so strikingly emphasizes, is a noteworthy fact in climatology.

Hult's classification is far too detailed, if all the smaller provinces are taken into account; but if only the larger kingdoms are considered, as in Plate II, the scheme is useful. It, however, posses-

ses no advantages over that of Supan, which takes account of more typical characteristics of climate. Ravenstein's hygrothermal types rest upon unsatisfactory data, and regions of very different climatic conditions are grouped together because they happen to have the same mean annual temperature and relative humidity.

---

THE NORTH AMERICAN SHEETS OF STIELER'S HAND-ATLAS.

BY

FREDERICK J. H. MERRILL.

The sheets of Stieler's Hand-Atlas relating to North America command serious attention because of the high accuracy and authority of this work. They comprise a general map of North America, a general map of the United States, a six-sheet map of the United States, a two-sheet map of Canada, one of the West Indies and Central America, and one of Mexico. It is much to be regretted that no special sheet was prepared of Alaska, which promises so much in its mineral wealth.

The six-sheet map of the United States is of especial interest, because it is the only recent one of our country on which so high a degree of engraving skill has been concentrated, for the establishment of Justus Perthes in Gotha stands unsurpassed in the world for the exquisite delicacy of its work in geographic engraving.

To the editor of these sheets, Mr. Hermann Habenicht, belongs high credit for the painstaking labour he has bestowed on the compilation. There is, so far as the writer is aware, no map of the United States on which so much geographic detail is clearly shown on the small scale of 61 miles to the inch; and, so far as he can discover from a careful inspection of the sheets, there is practically nothing which has been omitted in the matter of topography and drainage. The culture has also received careful attention; for the number of places with names is exceedingly great, and almost no place that has been located on any of the larger maps has been omitted from this laborious compilation. These maps, therefore, in point of completeness and accuracy of geographic detail, stand certainly unsurpassed, and probably unequalled.

To publish such a series of maps without errors of any sort would be beyond the scope of possibility; and on account of the international character of the publication, the writer has given a some-



what critical study to the errors which appear in it, believing that from them a useful lesson might be drawn as a guide to others in the compilation of similar maps, and possibly to the publishers of the sheets in question for the preparation of future editions. The errors observed are mainly in names, and are of several classes, which may in general be stated as follows:

a. Mis-spelling of names which have no obvious ordinary meaning, and which, therefore, require geographic knowledge for their detection.

Under this heading one may note at random: Sheveport for Shreveport, La.; Chipple Creek for Cripple Creek, Col.; Fernandino for Fernandina, Fla.; Tomocacori for Tumucacori, Arizona. Many such instances could be cited.

b. Mis-spelling of names which have an ordinary meaning, and in which errors could be detected by a well-educated person. Errors of this class are especially noticeable within the former limits of New Spain.

As one looks over the southwestern portion of the United States, in the territory obtained from Mexico by conquest and purchase, as well as south of the national boundary within Mexican territory, one notices many errors in spelling which would have been detected if the map had been placed under the inspection of a proof-reader who knew Spanish. At random we observe in Sonora, Viñateria for Vinateria; Cineguilla for Cienaguilla. In Arizona, Navajoe for Navajo; in New Mexico, Alamagordo for Alamo-gordo; in California, Cayole for Coyote, and Santa Anna for Santa Ana.

c. Mis-spelling of names which in other parts of the sheet are properly spelled.

Under this head we notice Papayo and Papago, Pesqueria and Pesqueira.

d. Inconsistency in the linguistic treatment of names of geographic features, using indiscriminately German, Spanish, and English words for the same feature.

It is primarily observed that the English words *lake* and *river* have been used with great uniformity throughout the United States, but in regard to some of the other features a random use of German has crept in; for instance, in Nebraska we find Sand Hills, but in Wyoming we find *Sand Dünen*. So, also, in Southern California we find Salton *See*, and at the mouth of the Colorado River *Schlammbänke*. So, also, on the coast of the United States the

English word Bay is used almost universally; while on the coast of British America, German and English, and on the coast of Mexico Spanish and English equivalents are used in bewildering alternation.

On the west coast of Vancouver's Island we find *Quatsino Sund*, *Kiyoukut Sund*, *Nootka Sound*, *Cloyoquot Sound*, *Barclay Sound*. So at the mouth of the St. Lawrence River we find *River St. Lawrence*, *Canadian Channel*; *St. Lawrence Golf*, *Belle Isle Strasse*. In the interior of Canada we find *Lake of the Woods*, *Lake Winnipeg*, *Lake Athabasca*, and then, suddenly, *Grosser Sklaven See*, *Grosser Bären See*, and the names of various Indian tribes in German. So, also, we read *Lake Huron*, *Georgian Bay*, and a little farther north *Hudson Bai*, *James Bai*.

On Sheet 89 we read *Baja California*, and immediately beside it *Golf von Californien*. So, also, *Bahia Viscaino*, and immediately beside it *Cristobal Bai*.

On Sheet 85, the general map of the United States, we find *Baja California* changed to *Nieder Californien*; and on Sheet 82, the general map of North America, we find *Halbinsel Californien*.

As *Baja California* is the name of one of the organized Territories of the Mexican Republic, these variations in terminology seem wholly indefensible.

On Sheet 85 we find *Neu Mexico*, although we also find *New York*, *New Hampshire*, and *New Jersey*, and we are somewhat surprised to see *Nova Scotia* turned into *Neu Schottland* and *New Brunswick* into *Neu Braunschweig*. *Lake Superior* also stands out in contrast with *Huron See*, *Michigan See*, *Erie See*, and *Ontario See*.

On Sheet 82 we are further interested in finding *Lake Superior* translated into *Oberer See*, the necessity for which is not at all evident.

On Maps 82 and 85 we find *St. Lawrence* spelled *St. Lorenz*, although on the sheet of East Canada the English form is used.

On looking at maps of various portions of the British Empire to ascertain what rule has been followed there, we see that in the British Isles English words are used throughout. So, also, in Australia. In Hindustan and vicinity, however, both German and English terms are used.

In the Philippine Islands Spanish and German terms are employed.

On the West Indian sheet, No. 93, we see a puzzling variation in the names of waterways; while our English word "key," for a small island, has been replaced by *cay*, even in the name of our City

of Key West. Republik Domingo is possibly an engraver's error for Santo Domingo.

e. Omissions, mainly in railroads and railroad stations.

The writer had with him the sheets in question during a recent trip through the southwest, and observed that a number of the newer railroads were omitted, notably the El Paso and Southwestern; in Arizona the railroad between Phoenix and Prescott, that from Williams to Grand Canyon, and some others. In this connection arose, no doubt, a question as to sources of information. The published maps, accessible to the compiler through the ordinary channels, would probably be deficient in some of the latest railroads; but if he had provided himself with some of the latest time-tables—or, better still, the commercial railway guides, which are published and revised monthly—he would have had the latest information in an intelligible form.

In ethnology some expert guidance will be necessary for future editions. The following special errors are noted:

The Apache Indians are shown on Sheet 89 as occupying most of the southern border of New Mexico and Arizona, while it is well known that since the capture of Geronimo in 1884 they have been restricted to certain reservations. Some variations are also noticed in the spelling of Indian names; for instance, Kioway, Navajoe (alluded to in class b).

A very remarkable bit of information comes to light in South-eastern Kansas, which is indicated as the habitat of a tribe of *New York Indians*. Just what fact was to be conveyed by this record remains to be determined.

A marked example of national expression is to be observed on the western limit of the United States, where the Pacific Ocean is labelled "Grosser Ocean." While one expects linguistic variations from the time-honoured name of Pacific Ocean, to depart so materially from this earlier name of distinct priority seems to have the same degree of logic as for a German geographer to assign to the Mississippi River some such name as "Grosser Fluss." It is to be hoped that the future tendency of mapmakers will be to reduce the number of geographic synonyms.

A variation is also noted in the abbreviation for the word Mountains, which in common English usage has come to be Mts. The sheets under discussion use indiscriminately Mounts., Mts., and Ms. It would seem to the writer that one abbreviation were far better than three.

The map of Mexico gives very satisfactory expression to the

topographic features of this remarkable country, and is probably the best small-scale map of Mexico in existence.

The main conclusion to be drawn from a critical inspection of these maps is that the publishers' staff is more highly trained in geographic compilation and engraving than in literary criticism. No very serious matter, perhaps, but still one worthy of consideration in the preparation of future editions.

In regard to possible improvements in compilation, the writer would suggest the revision of those parts of Sonora and Chihuahua shown on Sheet 89 of the Southwestern United States. Here, the boundary between these two important States is omitted, the drainage needs revision, and much detail might be added by referring to the best maps of Sonora—namely, that of Herbert, published in Nogales, and that of Max Bohmer, of Hermosillo, engraved by J. Köhler in Hamburg.

With all the painstaking effort in general compilation one notices a lack of quantitative expression in continental relief. For the United States the 40-mile contour map of the U. S. Geological Survey put in small scale by the experts of Justus Perthes' establishment would be a marvel of physiographic detail. In this respect the physical maps of the various continents published in Vivien de Saint Martin's General Atlas, now continued by Schrader and issued by Hachette in Paris, are worthy of attention for their exquisite detail and harmonious, distinctive, and expressive coloring.

---

## A FIELD FOR STUDIES IN REGIONAL GEOGRAPHY.

BY

WALTER S. TOWER.

*The Evolution of Geography.*—Geography, in name at least, finds a place among the earliest sciences, but during its life the content of geography has undergone material changes. Until the nineteenth century geography was almost entirely descriptive, concerning itself with the study of the earth *and* its inhabitants. There was little place for explanation, and hence little correlation between the two elements. The first definite change was effected in the early part of the nineteenth century by the introduction of explanation along with description. Explanation brought out the relationships previously unemphasized, and geography came to be the study of the

earth in relation to its inhabitants. The idea of inhabitants was still almost synonymous with man. The element of human interests, therefore, was chiefly emphasized, while the side of plant and animal responses, in general, received little consideration.

The second change, by which geography was brought down to its present status, came about in the latter part of the last century as a result of the newly-propounded theory of evolution. The dawning idea that the earth had not been adapted to the convenience of its inhabitants, but that the inhabitants had gradually adapted themselves to their environment, made it necessary to regard geography no longer as the relation of the earth and man alone, but as the relation of the earth and life. The study of the fleshy leaves of desert plants was thereby made to belong to geography as much as do the fleetness of foot and the coloration of the animals, the long abstinence from drinking on the part of the camel, or the swarthy skins and nomadic habits of desert peoples. The turned-up leaves of a morning-glory on the sand dunes of Bermuda are items of geographic interest in the same way as are the white dress and the open huts of the Filipino native, or the snow houses and the bone implements of the Esquimaux.

*Divisions of Geography.*—The subject of geography, therefore, arranges itself naturally under two heads: the one dealing solely with the conditions of the physical environment, the other including all the responses that life has made to its environment. The former division has long been known as physiography, and has received much attention; the latter division has practically no generally-adopted name, and has, until recently, received but relatively little attention. For this division Professor Davis has suggested the term *ontography*—analogous in form and derivation to the associated term physiography—but it is rarely seen in print. In its place, rather, are found such compromises, or partially descriptive, terms, as “political,” “commercial,” “economic,” “historical,” anthropo-, zoo-, or phyto-, geography. Many of these terms are indefinite at the best, overlapping one another to such an extent that the province of each is but poorly defined even in the minds of those by whom they are commonly used. But the terms are still apparently destined to become firmly rooted in popular usage because of the degree of suggestion of the special field with which each is supposed to deal.

*Present Tendencies in Geography.*—The last decade has seen a great advance in the emphasis placed on the importance of geography as a study co-ordinate with others, and also as a funda-

mental influence in history, economics, and kindred subjects. Perhaps the best indication of this growing interest is shown in the many books for general reading and reference, and for use as texts, dealing with different phases of geography from a great variety of standpoints. Whole series of books of travel and exploration have been published, others are in the process of completion, under the name of geography, to catch the fancy of the many to whom geography is a new and, perhaps, passing interest. Many of these volumes contain much of value and interest to the trained geographer, and as a source of collateral reference they serve a useful purpose. But the general method of presentation is too often popular and at random, rather than that of intelligent, correlated interpretation. It is more of a reversion to simple description after the idea of a century ago than it is an advance according to the present understanding of the word "geography." The element of relationship between environment and life, instead of being vivified and dressed attractively, must too often be worked out by the reader or else lost entirely. These books, as a rule, deal with but a small chapter of geography, with a single country, as India, Arabia, or Japan; or with a single series of explorations, as along the Nile or the St. Lawrence valleys. In their generally readable form, however, they are valuable toward creating an ever greater interest in geographical knowledge; and in the character of the subject presented they may be regarded as forerunners of a general tendency in geographical studies.

The other great class of publications, the field of text and of special reference books, has been equally important, though perhaps less prolific. These books include texts of physiography; elementary and advanced geographies; texts of commercial and economic geography; and of historical geography, written according to all varieties of scope and methods of treatment. Among them also are found the exponents of the so-called "new" geography, who imply that the responses of life to its environment have recently undergone radical changes. So numerous are the different texts that in many ways there seems to be little need for additional attempts at mere re-statement. This is especially true with reference to physiography, while on the ontographic side it is, perhaps unfortunately, not so true. In the texts, aside from physiography pure and simple, the criticism can be applied almost without qualification, that they are throughout too historical, commercial, or economic, and not enough geographic. The commercial or historical aspects are set forth clearly enough, exact and in sufficient



detail, but the setting made by the physical environment is lacking: the element of relationship in the commercial or historical response to the environment is not always plainly or sufficiently brought out.

The realm of the fundamental principles in geography has been thoroughly covered in the many volumes which deal with different phases of the subject. Many of the elementary texts can necessarily deal only with the simplest and most important underlying facts, and therefore make man the most conspicuous consideration on the side of life. More complete texts include greater amounts of detail, but still are confined by space to matters of general, rather than of individual or of local importance. Before geography can be regarded as complete, however, these lesser details of local importance must be studied and grouped appropriately along with the large items.

*Regional Geography—an Advance.*—Herein, it seems, lies the direction for future advance in geography. The utilization of the general principles, applied to restricted areas rather than to world-wide forms and responses, will make possible greater attention to the local items, and will enable the working geographer to describe and explain every part of the area which he observes. Just as in the general studies only the more important land-forms can be described, usually by a type example, so only the larger responses, usually of man, can be explained. But when the area is limited, the number of forms is less and the smaller items with their responses find their appropriate places. Such studies in regional geography seem to offer the most profitable field at present for the active geographer.

The first step along the new way is apparently indicated by the great number of recent books, already referred to as semi-descriptive, semi-geographic in nature, dealing with different countries and regions of the world. Such books may well be regarded as forerunners of thorough, systematic regional studies, in much the same way that the descriptive attitude of a century ago was the forerunner of the present-day geography. In some of our own States there have already been thorough studies of the physical features; Maryland, New Jersey, and New York have furnished material for accurate studies in regional physiography. Only the relationship of life needs to be added to make complete correlated regional geographies.

*Relation of Regional and Systematic Geography.*—A regional geography, however, should be more than correlated, more than descriptive or complete in explanation. It must be systematic.



That general geography must be systematic is usually accepted by most teachers and students at the present time, though there is still an unfortunate diversity of opinion concerning the bases, and the order, of classification. Only by following some sort of system, however, can regional studies have any value with reference to the general study, or in comparisons with similar studies in other regions. If in every area each item is described as an unclassified special item, the most valuable part of the study, the element of relationship, the similarities and differences in a class of forms and responses, is lost. Therefore, to adopt some logical systematic scheme of classification which the regional study is to follow, becomes the duty of the geographer at the very outset. Such a classification is preferably drawn from general systematic geography, using every head and sub-head which has an example in the given region. This procedure not only simplifies the geographer's task, but also makes more apparent the actual contribution to the advancement of geographical knowledge.

*A Logical Classification.*—The most acceptable classification must be the one which is based on the simplest, yet most universal and fundamental characters: a classification at once broad enough to include every world-wide item which may be found, and yet capable of being applied to any region, however restricted in extent or variety of conditions. Systematic classifications are usually based solely on the characters of land-forms; while the responses of life, when classified at all, are grouped under the heads of the forms to which they are most closely related. As meeting the desired requirements, it has been suggested that:\*

Land forms are classed first as to kind, according to their rocky structure; thus one area may be of horizontal structure; a second may consist of broken and tilted blocks; a third may have a domed structure; a fourth may be folded; a fifth may be of volcanic origin, and so on.

Each kind of land form is then to be classified according to its stage in the cycle of erosion, to which it is introduced by initial processes of deformation and (relative) upheaval, and through which it progresses by the action of weathering and washing, toward an ultimate goal of obliteration in a featureless plain close to sea-level, or in a smooth platform at an undetermined depth beneath sea-level. There is to-day abundant warrant for asserting that the sequence of developmental stages through this destructive cycle of erosion is remarkably systematic, and that very effective description of land forms may be given by characterizing them simply as young, mature or old.

*Advantages of Classification.*—Such a classification, framed for the whole realm of geography, so as to include the broadest conditions of world-wide importance, is no less readily adapted to smaller areas in regional studies. Two illustrations may be drawn from a study of Pennsylvania, where the same series of strata appear in the anthracite and in the bituminous coal fields. The first may be

\* Davis, W. M.—"Systematic Geography." *Proc. Amer. Phil. Soc.* Vol. XLI. No. 170. 1902. p. 243.

classified under the fourth head suggested above, as closely-folded mountains; the second area may be classified under the first head, as a plateau of nearly horizontal strata; while to both may be added the description, on the basis of stage of erosion, "once base-levelled and again elevated and maturely dissected." This designation should immediately prepare the student for certain general conditions to be met—notably, accordance of upland levels, more or less rugged relief, habitations and lines of travel largely confined to the valleys, and so on. It therefore no longer becomes the geographer's task to recount the general features of all folded mountains or of all plateaux. He is free to devote every attention to the features peculiar to the individual region under discussion. By building from the general knowledge already possessed by the reader, the study can be carried to greater detail of description and more complete explanation of complexity, both in the environment and in the responses of life.

*More Detailed Classification Necessary.*—But in order that there shall be places in the scheme to receive those items necessarily excluded from the general treatise, there must be added elements brought forward to serve as bases of classification. There must be smaller sub-heads than can be made on the basis of rock structure and the amount of erosion on that structure. The effects of erosion on any given structure will be manifestly different when the strata are homogeneous, and when they are of varying texture. The texture of the rocks, therefore, becomes a natural and logical basis for further subdivision necessary for regional studies. If the folded mountain region of Pennsylvania is described as above as a folded mountain region, etc., certain general features are suggested; if described as a closely-folded mountain region, with alternating hard and soft strata, etc., the anticipated features at once become more specific. The alternation of even-crested ridges and narrow linear valleys is expected, as a result of differential rates of erosion, and many conditions of life may be predicted, as forested, untillied ridges, fertile populous valleys, and so on. Or, again, to say "a maturely-dissected plateau of nearly horizontal strata" means one thing, while to add "of varying texture" means much more of detail. In the general study there is not space for the details of lesser characters. The regional study, however, meets the need for their explanation; it is their proper place, and there they must be included.

Other factors besides rock texture must often be used as minor bases of classification. Humid and arid climates, and glaciation, for

example, all mean different physical forms produced and preserved, and hence different influences on life. A maturely-dissected plateau in the moist climate of Pennsylvania will not exhibit the same sort of sculpture by erosion and the same controls of life as will a maturely-dissected plateau in the arid West. An unglaciated portion of the plateau in Southern Pennsylvania does not present the same conditions as do the glaciated portions along the New York State line. A volcano in Ecuador may be identical in size and form with a volcano in Alaska, but the responses of life will be widely different in the two cases.

*Terminology.*—Physiography makes use of the terms young, mature, and old in describing well-known features characteristic of certain degrees or stages in the cycle of denudation, entirely apart from any idea of organic response. As pointed out in a recent article:\*

Confusion might easily arise if we try to classify a *region*, characterized by diverse features, as young, mature, or old.

But the difficulty is not with the terms or with the system in which they are employed. The difficulty is in applying them to a *region*, whereas they were intended as terms descriptive of *features* in a region. It is the province of general geography to describe and explain the conditions characteristic of land-forms, plains, plateaux, mountains, and rivers, in youth, maturity, and old age. Drawing illustrations is necessary, as in using western Pennsylvania and West Virginia as an example of a mature plateau, but not necessarily a region which is mature in every element of the topography. The student of a region must, therefore, constantly guard against the application of his special terms to the area as a whole. To give the appropriate conditions for every topographic feature, in whatever stage of development it may be, is one of the chief aims and purposes of the regional study, for only by that means can the complexity of conditions find an adequate explanation.

*The Logical Successor of General Geography.*—The nature of the regional study, therefore, makes it the logical successor of the general study. Without the preliminary training of the general systematic geography, the principles of which are to be applied to a given region, the study of the region can be of little more value in geography than would be regional studies in botany or zoology without a knowledge of the principles of plant or animal classification. Hence the regional study becomes valuable not only

\* Johnson, D. W.—"Youth, Maturity, and Old Age in Physiographic Forms." *Bull. Amer. Geog. Soc.* Vol. XXXVII. No. 11. Nov. 1905. pp. 649-650.

to the young student in geography, as furnishing a source of detailed information, but it is valuable also to the advanced student and to the working geographer as offering a field in which he may build from the foundation already possessed, test the practical value of his scheme of classification, and in an intelligent interpretation of a region give an actual contribution to geographical knowledge.

*Difficulty in a Broad Field.*—A regional study—as of a State, for example—in order to be complete, must include a thorough description of all the physical features, properly classified and referred to their places with respect to the whole group of land-forms. Along with this description must be included the explanation of every condition of life in so far as it has been determined or modified by the physical environment. It must give the responses of man in his activities, social, political, historical, and economic; of plants and of animals, in their distribution, selection, and adaptation. Each must receive its proper weight and bear its relationship to the class in which it belongs.

It may be argued that, to be entirely logical in the systematic presentation, every influence on life should be grouped along with the appropriate land-form from which it is a response. But in any extensive study, as even of a single State like Pennsylvania, the diverse physical conditions entail many complex organic responses, and may make it advisable to divide the discussion sharply under two heads: under the one, physiography alone; under the other, all responses of life. Such a division not only favours clearness of presentation in a complex subject, but also gives more readily-contrasted conditions in the different areas, with a minimum degree of repetition.

*Usefulness.*—For a series of such regional studies as here outlined, there is an actual urgent need at the present time. Geography has an important place in the schools of all grades throughout the country. General text-books are available, with texts written according to schemes varied enough to meet the demands of every teacher and every class of pupils. The general importance of environment to human activities, in their broader aspects, is set forth in part in the texts of the commercial and the economic geography type. The increasing need now is for thorough studies of separate regions, by which the broader training may be supplemented. It is more often the local conditions which most closely affect the individual, and which make the subject most alive, especially to the student of one or two years' standing. And it is

the local conditions which hold the most important place in regional studies.

Excellent histories of many of the States in the Union have met the demand for regional studies in history. But almost nowhere has there been an attempt at similarly complete accounts either of the physical conditions which the pioneer met, or of the influences which these conditions have exerted over the subsequent development of the regions. To have such a series of regional geographies for each State or group of States in the country would mean a great stride toward a better and a more general understanding not only of the economic and the social development, but also of history and political conditions as well. Such studies should be of value, not alone to the student of geography, but also to the historian and the economist. They should be of value, not merely to the people of the State or region, but to every one who would gain an idea of the different elements on which the units of the nation have been built.

*University of Pennsylvania.*

---

## AN AMERICAN PANAMA.

SOME PERSONAL NOTES ON TROPICAL COLONIZATION AS AFFECTED  
BY GEOGRAPHIC AND POLITICAL CONDITIONS.

BY

POULTNEY BIGELOW, M.A.,

Life Member of the American Geographical Society; Fellow of the Royal  
Geographical Society, London.

Three points of view are at present important in the discussion of our new acquisition, Panama:

First, the engineering problem;

Secondly, the conditions of life as affected by climate or geographical conditions;

Thirdly, the colonial aspect, or the relations of the future colony to the government responsible for its development.

As to the engineering point of view, I can say nothing at first hand; but, in view of the political acrimony just now creating a cloud of doubt about this great enterprise, I venture to affirm that, at least in the opinion of several of the most eminent engineers of this country, if not of the world, the task of digging a canal from Colon

to Panama offers no physical difficulty which would for a moment discourage men familiar with great engineering tasks of recent years in this country, such, for instance, as the New York Subway.

Notable it is, to be sure, that our great engineers are not crowding forward to offer themselves as servants of our Government in this crisis. On the contrary, they not only decline service, but they hesitate to express opinions in public, for fear of inviting the ill-will of politicians, who resent criticism.

Secondly, our discussion touches upon the condition of life in the tropics generally and Panama in particular, and here we must carefully sift evidence, because so many men who visit a tropical country for the first time are apt to measure things there exclusively by the standards to which they are accustomed in a northern climate.

For my part, I may be permitted to interject here that Panama is not the first tropical country that I have visited—that, indeed, I have made a study of nearly every tropical colony in the world, including the German islands of New Guinea, where I cruised alone in my canoe to places which the German Governor assured me no white man could approach without risk of being eaten up by cannibals.

This was my fourth visit to the Caribbean, and before these visits I had studied the negro as a labourer in every colony of South Africa, including the Portuguese Mozambique.

I had sailed my canoe around both Antigua and St. Thomas in the West Indies, in order to study the negro at closer range than is usually possible to the tourist, and had, besides, had opportunity of studying him in each of our own Gulf States at different times.

The labour problem is the great, if not the only, problem demanding serious and immediate attention at Panama, and it is one so intimately bound up with the future of Panama as a colony that it deserves scientific treatment, wholly divorced from the momentary needs of party politics.

To-day we have at the Isthmus a white population numbering only a few hundred, who are mainly from the Northern States of our Union, and who are engaged as inspectors and in clerical work generally. They live in the least unhealthy portions of the Zone, are paid in gold, while the negroes are paid in silver, and altogether represent the momentary aristocracy of our colony.

Then, we have the body of labourers or colonists who are almost wholly alien negroes from British islands—who speak only English, and who have been reared under a colonial system where the respect



for law is universal, where judges are appointed for life, and where political influence has never been suspected amongst those seated on the bench.

Note, then, that Panama so far has drawn no negroes from our own Southern States, but only negroes who have no votes on our territory, and; consequently, represent no political force.

Experience with negroes teaches that the success of planters depends largely upon the relative capacity of masters to make their workmen happy in their work. I have visited plantations practically equal in soil, climate, and number of hands, and yet while one landlord will praise his men and close his year's balance with a smile, the other will curse the negro as a stupid brute and find fault with everything—save himself.

This is almost universally seen in every country where the negro is the main labourer. I have noted it in tropical Africa no less than in different parts of the West Indies, and I am sure that hundreds of our Southern planters will confirm it within their own experience.

My stay on the Isthmus lasted two days—ten hours of one day and ten hours of the second day, with eight hours for sleep.

One day was a holiday, the next was a working day; so I saw my people at work and at play.

Of those two days I spent the major part in the swamp called Colon—a pest-breeding wallow nearly a mile long, immediately back of the show street which fronts the waters of the Caribbean Sea.

In this swamp I was accompanied by Mr. Tracy Robinson, who is one of the oldest residents on the Isthmus and also one of the most respected. He has published a volume of poems, and has been repeatedly invited to deliver the oration on national holidays by his American fellow-citizens.

My other companion into the swamp of Colon was Mr. Sands, our Secretary of Legation at Panama, a worthy representative of our country. With these two gentlemen I made many photographs showing the state in which several thousand negroes are living under conditions disgraceful to us as a Christian and progressive nation. The people in this swamp have come to the Isthmus at our invitation and have a right to expect the common decencies of life, such as water to drink, streets that can be used, and places where they may throw their sewage and excrement without leaving it to pile up at their very doors.

The climate is by many looked upon as the cause of the fevers at Panama, but this I venture to doubt. There are many analogies to Panama and Colon throughout the colonial world, and these an-



alogies, when studied historically, lead to the conclusion which harmonizes with experience, that tropical climate may be much modified by human foresight and energy.

For instance, Durban in Natal, which I visited in 1896, was already then a favorite seaside resort for the Boers of the Transvaal; and yet within the memory of men then living it had been a place notorious as a hotbed of fever.

To the late Sir Harry Escombe is mainly due the credit of having brought about the public sentiment which raised the necessary taxes to drain the swamps and thus abolish mosquitoes and fever at the same time.

We have but to drain the Colon swamp, and fevers will disappear, as they have from many other places situated in similar geographical positions.

To-day the Portuguese port of Delagoa Bay is suggestive of Colon in the filthy neglect of sanitary measures—yet Delagoa Bay is practically close neighbor to Durban. All she needs is a little British enterprise and honesty, and she, too, will become another health resort.

Demarara, at the mouth of the Essequibo, would be another Colon but for the far-sightedness of the original Dutch colonists in treating their swamps according to the example of the mother country; and the British, who now rule that rich dependency, have continued to keep it well drained, and, therefore, healthy. You do not hear any complaints about mosquitoes and malaria in Demarara.

The moral of all this is, that we might do well to send to some tropical colonies, where conditions are analogous, and borrow for our own use some administrators familiar with the problems confronting us here. Or, if that runs counter to our national pride, then let us do the next best thing and select for our managers, inspectors and bosses generally, not men from Ohio or Michigan, but rather draw our canalization forces from the Gulf States of the Union. Let us choose young men who have a good record as managers of plantations, who stand well with negroes, who know their habits and humours, who are honest and good-tempered, yet firm.

The negro is an easy man to work with if you understand him, and it is of the highest importance that we select for canal jobs white men who do know the negro; but, unfortunately for us, most of our white men who do know the negro have probably voted the Democratic ticket!

The geography of Panama as a colony is most encouraging—a

diversified landscape, abundantly watered and capable of growing almost everything demanded by reasonable colonists.

To-day we have not yet any laws under which a settler can acquire land or even a leasehold. Consequently, there is not yet a beginning of farming, and until this arrives we must expect high prices for provisions and consequent dissatisfaction amongst those who do not enjoy canned food in the tropics.

Under an honest and efficient colonial rule we may look forward to the building of roads throughout our new possession, the draining of all swamps, and the accurate surveying of the land, in order to encourage settlers who come for the purpose of providing fresh vegetables and dairy produce to the thousands already there and to the hundreds of thousands whom we may anticipate as the result of good administration.

It is easy now to look ahead and protect the people against the evils incident to land speculation. The Government should retain all rights as a paramount landlord, and permit people to purchase only on condition that in case they resell, then the Government shall be entitled to buy back the land at a just valuation, and not at the fancy price which tempts the land speculator.

Germany has wisely introduced this principle of land tenure in Kiao Chau, and, from what I am able to gather, it works admirably.

Then, too, tropical climates demand that white men who go there as colonists keep their bodies well toned up physically—for physical depression may soon be followed by mental depression, and then follows disease, and then, off for home, with a tale of the "horrible climate!"

Tropical colonies teach the lesson that the successful administrators are those who themselves take plenty of outdoor exercise each day and who insist upon corresponding exercise in their subordinates.

The Germans fail to get the best out of their colonies for the reason that their administrators are, as a rule, men with no interest in healthy sports, but inclined to spend their evenings round a beer table rather than on the polo field or in kicking a football.

On the canal Zone, although I went the whole length of the canal strip and back and talked with many employees there, I could find scant trace of any interest in out-door sports, so far as the Government administration is concerned.

Before the canal can be built the matter of making people contented on the Zone must be studied by those who have had previous experience with the elements of this problem.

The negroes who come to us must have their families, if they are to remain more than a few months.

Before we can make progress in this great work, we must face the truth and lay broad foundations. This is impossible if we continue to permit this work to be the sport of politicians and the jobbery which inevitably springs from an enterprise where there are half a dozen commanding generals, immense opportunities for mistakes, miles of red tape, and many millions of dollars yet to spend.

## GEOGRAPHICAL RECORD.

### AFRICA.

TWO ARTICLES ON THE MAHARI (dromedary or African camel)—one by Capt. Mathieu and the other by E. Michal, interpreter, etc.—deserve notice, the former for its information on reproduction and raising of the dromedary, the other for a detailed account of the diseases and accidents to which the animal is exposed. Not less than twenty-six infirmities or lesions are enumerated, and—what is more valuable still—the methods for relief used by the Arabs are circumstantially given. For zoological gardens or wherever attempts are made to introduce the camel away from its home, the article of Mr. Michal is of importance.—(*Bulletin of the Société de Géographie d'Alger et de l'Afrique du Nord, &c.*, 1905, third quarter.)

ACROSS MADAGASCAR.—An entertaining and matter-of-fact description of a journey from Tamatave to Maintirano in 1902, by E. F. Aside from pleasing descriptions, it contains some not indifferent data concerning the early history of the Hovas, the information (not new) that these did not by any means control the whole island, and considerable ethnologic information of a cursory kind. The opinion as to the value of Madagascar for France is certainly not exaggerated.—(*Bulletin, Société de Géographie d'Alger.*)

THE BERBER WOMAN IN ETHNOLOGY AND ALGERIAN HISTORY.—This posthumous paper of Lieut.-Col. Rinn deals with the position of woman among the Berbers, but begins with a defense of Mahommedanism in its relations to the female, asserting that "the supremacy of Islam in Berber society has frequently maintained and legitimized the part played by woman, in the ethnology and history of northern Africa." The interesting fact is established that the Berbers, in times long past, had matriarchy, the names of many of their subdivisions as well as tradition indicating descent in the female line. Follows a long list of women celebrated among the Berbers for remarkable actions, all given in support of the claim that Mohammedanism concedes to woman a much higher place than generally supposed. Since the author of this rather imperfect essay is no longer among the living: *De mortuis nihil nisi bene.*—(*Bulletin, Soc. de Géog. d'Alger.*)

A LIVING OKAPI SEEN.—Captain Boyd Alexander of the Alexander-Gosling Expedition, which arrived early in March at Bima in the Congo Free State, has

written to England that the expedition has secured a specimen of the okapi and that he has seen the animal alive. A letter from Captain Gosling, under date of February 26, says that Captain Alexander is sending a description of the specimen secured. The interest in this curious ruminant, which is related to the giraffe but simulates the zebra in its markings, is due to the fact that it was discovered by Johnston only a few years ago and is confined to a narrow habitat in the northeast part of the Congo Free State, though in past geological ages it appears to have been distributed much more widely, and even to have inhabited the south of Europe. At least it is asserted that it is practically an okapi which Professor Gaudry found in a fossil state in the pikermi beds, Peloponnesus, and which was named the *Helladotherium*. Captain Gosling sends some notes on the okapi as it exists in the forests of the Welle, Libuati, and Rubi Rivers, which will be read with interest:

The okapi here is generally found singly or in pairs, but Mobatti hunters say that sometimes three are found together. An essential to its life is a small stream with some swampy and muddy ground on either side. In this grows a large leaf that on its single stock attains a height of ten feet. The young leaf of this plant is the favorite food of the okapi; and I venture to say that where the plant is not found the animal will not exist. During the night he will wander along in the mud and water in search of it. Here he may be found feeding as late as 8 A.M., after which he retires to the seclusion of the forest, where he remains till nearly dusk. On the three occasions that I was at close quarters with the beast he was perfectly concealed in this water leaf. Near the river Welle I found his spoor on ground frequented by buffalo and water buck; but this is unusual, and his companions in the forest are the elephant, the greater bush buck, and the yellow-backed and small red duikers. The okapi is very quick of hearing. He is killed occasionally by the natives, being speared, shot, or trapped by the common African methods. At the first village I visited three had been speared at various times.

#### AMERICA.

THE CALIFORNIA EARTHQUAKE.—On the 21st of April the Governor of California issued the following letter:

TO WHOM IT MAY CONCERN:

The bearer, Professor A. C. Lawson, of the State University, together with Professor G. K. Gilbert of the United States Geological Survey, Professor Fielding Reid of Johns Hopkins University, Professor J. C. Branner of Stanford University, Professor A. O. Leuschner of the State University, Professor George Davidson of the State University, Professor Charles Burkhalter of the Chabot Observatory, and Professor William Wallace Campbell, Director of the Lick Observatory, are hereby constituted a Committee of Inquiry into the earthquake phenomena in all parts of the State of California, and the citizens of the State are hereby requested to co-operate with this committee in all possible ways, affording them all necessary information and access to the results of the earthquake disturbances.

GEO. C. PARDEE,  
Governor of California.

Dated Oakland, Cal., April 21, 1906.

The Commission met for purposes of organization on April 24, at 12 o'clock noon, in the University of California. Professor Andrew C. Lawson was elected Chairman, and Professor A. O. Leuschner Secretary. For purposes of correspondence it was decided that the Commission should be known as the "State Earthquake Investigation Commission." It was determined that the scope of the work of the Commission in its preliminary stages should embrace the questions as to the origin, the position, and the character of the disturbance in the earth's crust which gave rise to the earthquake, these questions to be investigated by:

1. The location of fault scarps and other deformations of the surface of the ground or sea-bottom in the region affected;
2. The collection of intensity records leading to the construction of coseismic curves;
3. The collection of intensity records and their classification in a graded scale leading to the construction of isoseismic curves.

The Preliminary Report of the Commission, submitted May 31, is as follows:

One of the remarkable features of the Coast Ranges of California is a line of peculiar geomorphic expression which extends obliquely across the entire width of the mountainous belt from Mendocino County to Riverside County. The peculiarity of the surface features along this line lies in the fact that they are not due, as nearly all other features of the mountains are, to atmospheric and stream erosion of the uplifted mass which constitutes the mountains, but have been formed by a dislocation of the earth's crust, or rather a series of such dislocations, in time past, with a differential movement of the parts on either side of the plane of rupture. In general this line follows a system of long narrow valleys, or where it passes through wide valleys it lies close to the base of the confining hills, and these have a very straight trend; in some places, however, it passes over mountain ridges, usually, at the divide separating the ends of the two valleys; it even in some cases goes over a spur or shoulder of a mountain. Along this line are very commonly found abrupt changes in the normal slope of the valley sides, giving rise to what are technically known as scarps. These scarps have the appearance of low precipitous walls which have been usually softened and rounded somewhat by the action of the weather. Small basins or ponds, many having no outlet, and some containing saline water, are of fairly frequent occurrence, and they usually lie at the base of the small scarps. Trough-like depressions also occur bounded on both sides by scarps. These troughs and basins can only be explained as due to an actual subsidence of the ground, or to an uplift of the ground on one side or the other, or on both sides. The scarps similarly can only be ascribed to a rupture of the earth with a relative vertical displacement along the rupture plane. Frequently small knolls or sharp little ridges are found to characterize this line, and these are bounded on one side by a softened scarp, and separated from the normal slope of the valley side by a line of depression. In many cases these features have been so modified and toned down by atmospheric attack that only the expert eye can recognize their abnormal character; but where their line traverses the more desert parts of the Coast Range, as for example in the Carissa Plains, they are well known to the people of the country, and the aggregate of the features is commonly referred to as the "earthquake crack."

This line begins on the north at the mouth of Alder Creek near Point Arena and extends southeasterly nearly parallel with the coast line to a point about two miles below Fort Ross, a distance of forty-three miles. Here it passes outside of the shore line and is again met with at the point where Bodega Head joins the mainland. Thence it appears to continue southward through Tomales Bay and Bolinas Lagoon. Beyond Bolinas Lagoon it passes outside of the Golden Gate and enters the shore again at Mussel Rock, eight miles south of the Cliff House. From this point it is traceable continuously along the valley line occupied by San Andreas and Crystal Springs Lakes, past Woodside and Portola, over a saddle back of Black Mountain, thence along Stevens Creek Cañon, passing to the southwest of Table Mountain and Congress Springs to the vicinity of Wrights, on the narrow-gauge railway between San José and Santa Cruz. From Wrights it continues on in the same course through the Santa Cruz Mountains to the point where the Southern Pacific Railway crosses the Pajaro River near Chittenden. From the crossing of the Pajaro the line extends up the valley of the San Benito River, across the eastern portion of Monterey County, and thence follows the northeastern side of the valley of the San Juan River and the Carissa Plains to the vicinity of Mount Pinos, in Ventura County. The line thus traced from Point Arena to Mount Pinos has a length of 375 miles, is remarkably

straight, and cuts obliquely across the entire breadth of the Coast Ranges. To the south of Mount Pinos the line either bends to the eastward following the general curvature of the ranges or is paralleled by a similar line offset from it *en echelon*; for similar features are reported at the Tejon Pass and traceable thence though less continuously across the Mojave Desert to Cajon Pass and beyond this to San Jacinto and the southeast border of the Colorado Desert. The probability is that there are two such lines, and that the main line traced from Point Arena to Mount Pinos is continued with the same general straight trend past San Fernando and along the base of the remarkably even fault scarp at the foot of which lies Lake Elsinore. But, leaving the southern extension of the line out of consideration as somewhat debatable, we have a very remarkable physiographic line extending from Point Arena to Mount Pinos which affords every evidence of having been in past time a rift, or line of dislocation, of the earth's crust and of recurrent differential movement along the plane of rupture. The movements which have taken place along this line extend far back into the Quaternary period, as indicated by the major, well-degraded fault scarps and their associated valleys; but they have also occurred in quite recent times, as is indicated by the minor and still undegraded scarps. Probably every movement on this line produced an earthquake, the severity of which was proportionate to the amount of movement.

The cause of these movements in general terms is that stresses are generated in the earth's crust which accumulate till they exceed the strength of the rocks composing the crust and they find a relief in a sudden rupture. This establishes the plane of dislocation in the first instance, and in future movements the stresses have only to accumulate to the point of overcoming the friction on that plane and any cementation that may have been effected in the intervals between movements.

The earthquake of the 18th of April, 1906, was due to one of these movements. The extent of the rift upon which the movement of that date took place is at the time of writing not fully known. It is, however, known from direct field observations that it extends certainly from the mouth of Alder Creek near Point Arena to the vicinity of San Juan in San Benito County, a distance of about 185 miles. The destruction of Petrolia and Ferndale in Humboldt County indicates that the movement on the rift extended at least as far as Cape Mendocino, though whether the line of rift lies inland or off shore in that region is still a matter of inquiry. Adding the inferred extension of the movement to its observed extent gives us a total length of about three hundred miles. The general trend of this line is about N. 35° W., but in Sonoma and Mendocino counties it appears to have a slight concavity to the northeast, and if this curvature be maintained in its path beneath the waters of the Pacific it would pass very close to and possibly inside of Capes Gordo and Mendocino. Along the 185 miles of this rift where movement has actually been observed the displacement has been chiefly horizontal on a nearly vertical plane, and the country to the southwest of the rift has moved northwesterly relatively to the country on the northeast of the rift. By this it is not intended to imply that the northeast side was passive and the southwest side active in the movement. Most probably the two sides moved in opposite directions. The evidence of the rupture and of the differential movement along the line of rift is very clear and unequivocal. The surface soil presents a continuous furrow, generally several feet wide, with transverse cracks, which show very plainly the effort of torsion within the zone of the movement. All fences, roads, stream courses, pipe lines, dams, conduits, and property lines which cross the rift are dislocated. The amount of dislocation varies. In several instances observed it does not exceed six feet. A more common measurement is eight to ten feet. In



some cases as much as fifteen or sixteen feet of horizontal displacement has been observed, while in one case a roadway was found to have been differentially moved twenty feet. Probably the mean value for the amount of horizontal displacement along the rift line is about ten feet, and the variations from this are due to local causes, such as drag of the mantle of soil upon the rocks or the excessive movement of soft, incoherent deposits. Besides this general horizontal displacement of about ten feet there is observable in Sonoma and Mendocino counties a differential vertical movement not exceeding four feet, so far as at present known, whereby the southwest side of the rift was raised relatively to the northeast side, so as to present a low scarp facing the northeast. This vertical movement diminishes to the southeast along the rift line, and in San Mateo County is scarcely if at all observable. Still farther south there are suggestions that this movement may have been in the reverse direction; but this needs further field study.

As a consequence of the movement it is probable that the latitudes and longitudes of all points in the Coast Ranges have been permanently changed a few feet, and that the stations occupied by the Coast and Geodetic Survey in their triangulation work have been changed in position. It is hoped that a reoccupation of some of the stations by the Coast and Geodetic Survey may contribute data to the final estimate of the amount of movement.

The great length of the rift upon which movement has occurred makes this earthquake unique. Such length implies great depth of rupture, and the study of the question of depth will, it is believed, contribute much to current geophysical conceptions.

The time of the beginning of the earthquake as recorded in the Observatory at Berkeley was 5h. 12m. 6s. A. M., Pacific Standard time. The end of the shock was 5h. 13m. 11s. A. M., the duration being 1m. 5s. Within an hour of the main shock twelve minor shocks were observed by Mr. S. Albrecht of the Observatory and their time accurately noted. Before 6h. 52m. P. M. of the same day thirty-one shocks were noted in addition to the main disturbance. These minor shocks continued for many days after April 18, and in this respect the earthquake accords in behavior with other notable earthquakes in the past. The minor shocks which succeed the main one are interpreted generally as due to subordinate adjustments of the earth's crust in the tendency to reach equilibrium after the chief movement.

The collection of time records necessarily proceeds slowly. The purpose of the coseismal curves based upon these records is in general two-fold. In ordinary earthquakes it is one of the means of locating the seat of the disturbance when there is no surface manifestation of the rupture in the earth's crust. In the present instance, however, the rupture has declared itself in an unmistakable rift observable at the surface, and coseismals are therefore unnecessary for the determination of this important factor in the general problem, so far at least as regards the main disturbance. It is probable, however, that so radical a change in the equilibrium of the stresses of the earth's crust would induce secondary ruptures and consequently secondary earthquakes closely associated with the chief shock. The careful plotting of the time records may, therefore, be useful in revealing the location of these secondary disturbances, such, for example, as the one which affected Southern California on the afternoon of the 18th of April. The second purpose of securing time records is the determination of the velocity of propagation of the earth wave; and the data for this which are likely to be most serviceable are the records obtained at various quite distant seismographic stations.

The destructive effects of the earthquake are in the main distributed with refer-



ence to the line of rift. The exact limits of the area of destruction have not yet been mapped, but it is known to extend out about twenty-five or possibly thirty miles on either side of the rift. On the southwest side the greater part of this area to the north of the Golden Gate lies in the Pacific. This area extends from Eureka in Humboldt County to the southern extremity of Fresno County, a distance of about four hundred miles.

Beyond this area of destructive shock the earthquake was felt in its milder manifestations over a wide territory. Our reports to date show that it was felt in Oregon as far north as Coos Bay and on the south as far as Los Angeles. To the east it was felt over the greater part of middle California and eastern Nevada, particularly along the eastern flank of the Sierra Nevada. It was felt at Lovelocks, and we have unconfirmed reports of its having been felt at Winnemucca. Far beyond the region within which it was apparent to the senses, however, the earth wave was propagated both through the earth and around its periphery; and some of the most valuable and most accurate records of the disturbance which we have are those which were registered at such distant seismographic stations as Washington, D. C.; Sitka, Alaska; Potsdam, Germany; and Tokyo, Japan.

Within the area of destructive effects approximately 400 by 50 miles in extent the intensity varied greatly. There was a maximum immediately on the rift line. Water pipes, conduits, and bridges crossing this line were rent asunder. Trees were uprooted and thrown to the ground in large numbers. Some trees were snapped off, leaving their stumps standing, and others were split from the roots up. Buildings and other structures were in general violently thrown and otherwise wrecked, though some escaped with but slight damage. Fissures opened in the earth and closed again, and in one case reported a cow was engulfed. A second line of maximum destruction lies along the floor of the valley system of which the Bay of San Francisco is the most notable feature, and particularly in the Santa Rosa and Santa Clara valleys. Santa Rosa, situated twenty miles from the rift, was the most severely shaken town in the State, and suffered the greatest disaster relatively to its population and extent. Healdsburg suffered to a nearly similar degree. San José, situated thirteen miles, and Agnews, about twelve miles from the rift, are next in the order of severity. Stanford University, seven miles from the rift, is probably to be placed in the same category. All of these places are situated on the valley floor and are underlain to a considerable depth by loose or but slightly coherent geological formations, and their position strongly suggests that the earth waves as propagated by such formations are much more destructive than the waves which are propagated by the firmer and highly elastic rocks of the adjoining hill lands. This suggestion is supported by a consideration of the destructive effects exhibited by towns and single buildings along the same valley line which are situated wholly or partly on rock. Petaluma and San Rafael, though nearer the rift than Santa Rosa, suffered notably less, and they are for the most part on, or close to, the rocky surface. The portions of Berkeley and Oakland which are situated on the alluvial slope suffered more than the foothills, where the buildings are founded on rock. The same suggestion is further supported from a consideration of the zone of maximum destructive effect on the southwest side of the rift. This zone lies in the Salinas Valley. The intensity of destructive action at Salinas was about the same as at San José, and the town is situated on the flood-plain deposits of the Salinas River. Along the banks of the Salinas River and extending from Salinas to the vicinity of Gonzales, so far as our reports at present show, the bottom lands were more severely ruptured, fissured, and otherwise deformed than in any other portion

of the State. The Spreckels Sugar Mill, situated on the banks of the river, suffered more severely probably than any other steel structure in the State. Santa Cruz, on the other hand, which is on the same side of the rift and at the same distance from it, but which is built on rock for the most part, suffered much less damage. In the northern counties along the coast the most severe effects were felt at Ferndale, on the south margin of the flood plain of the Eel River, and at Petrolia, on the bottom land of the Mattole. Fort Bragg was severely shaken with very destructive effects, but our reports do not yet indicate the character of the ground upon which it is situated.

In the facts which have been cited we seem to have warrant for a generalization as to the excessively destructive effect of the earth wave as transmitted by the little coherent formations of the valley bottoms. But it must be borne in mind that by far the greater number of structures subject to destructive shock are situated in the valley lands and that there has not yet been time for a detailed comparison of the effects in the valleys with those in the hills, where the buildings are founded on firm rock except in a few notable instances.

The most instructive of these instances is the city of San Francisco, and the facts observed there are entirely in harmony with the generalization above outlined. In the city of San Francisco we may recognize for preliminary purposes four types of ground: (1) The rocky hill slopes; (2) the valleys between the spurs of the hills which have been filled in slowly by natural processes; (3) the sand dunes; (4) the artificially filled land on the fringe of the city. Throughout the city we have a graded scale of intensity of destructive effects which corresponds closely to this classification of the ground. The most violent destruction of buildings, as everybody knows, was on the made ground. This ground seems to have behaved during the earthquake very much in the same way as jelly in a bowl, or as a semi-liquid material in a tank. The earth waves which pass through the highly elastic rocks swiftly with a small amplitude seem in this material to have been transformed into slow undulations of great amplitude which were excessively destructive. The filled-in material and the swampy foundation upon which it rests behaved, in other words, as a mass superimposed upon the earth's surface, rather than as a part of the elastic crust itself. In a less degree the same thing is true of the sand-dune areas, where the ground was frequently deformed and fissured. In still less degree the naturally filled valleys between the hill spurs were susceptible to this kind of movement, and the destruction of buildings was correspondingly less, but still severe, depending very largely on the character of the buildings, the integrity of their construction, etc. In portions of these valleys, however, the original surface of the ground has been modified by grading and filling, and on the filled areas the destruction was more thorough than elsewhere in the same valley tracts. On the rocky slopes and ridge tops, where, for the most part, the vibration communicated to buildings was that of the elastic underlying rocks, the destruction was at a minimum. On some of the hills chimneys fell very generally and walls were cracked; on others even the chimneys withstood the shock.

While this correlation of intensity of destructive effect appears to hold as a generalization, there are well-known exceptions which find their explanation in the strength of the structures. Modern class A steel structures with deep foundations appear to have been relatively passive, while the made ground in their immediate vicinity was profoundly disturbed. Thoroughly bonded and well-cemented brick structures, on similarly deep and solid foundations, seem to have been equally competent to withstand the shock, except for occasional pier-like walls not well tied to the rest of the

building. The weak points in wooden frame structures were in general the faulty underpinning and lack of bracing, and chimneys entirely unadapted to resist such shocks. With these faults corrected, frame buildings of honest construction would suffer little damage beyond cracking of plaster in such a shock as the 18th of April, save on the made ground, where deep foundations and large mass appear to be essential for the necessary degree of passivity.

Pipe lines and bridges crossing the rift line present a peculiar, if not quite unique, engineering problem which will doubtless be solved in the near future. Pipe lines on low swampy ground or in made ground are in much greater danger of destruction from earthquake shocks than those on high ground underlaid by rock, except in the immediate vicinity of the rift, where nothing could be constructed which would withstand the violence of the earth movement.

One of the lessons of the earthquake which seems peculiarly impressive is the necessity for studying carefully the site of proposed costly public buildings where large numbers of people are likely to be congregated. In so far as possible such sites should be selected on slopes upon which sound rock foundation can be reached. It is probably in large measure due to the fact of their having such a rock foundation that the buildings of the State University, at Berkeley, escaped practically uninjured. The construction of such buildings as our public schools demands the most earnest attention of the people and of the authorities charged with their construction. A great many of our schools proved to be of flimsy construction and ill adapted to meet the emergency of an earthquake shock of even less severity than that of the 18th of April.

The Commission, in presenting this brief report, has had in mind the demand on the part of the people of the State and of the world at large for reliable information as to the essential facts of the earthquake. It has, therefore, not presumed to engage in any discussion of the more abstruse geological questions which the event naturally raises. It leaves such discussion for a more exhaustive report, which can only be prepared after the campaign of data collection is complete, and that may be some months hence.

Very respectfully submitted in behalf of the Commission,

ANDREW C. LAWSON,  
Chairman.

A. O. LEUSCHNER,  
Secretary.

#### EUROPE.

THE NEW MAP OF PARIS.—A letter to the Society from Paris says that the Service Géographique de l'Armée, to which is entrusted the entire topographic survey work of the country, is making excellent progress with the new map of France in eight or nine colours which is being published on the scale of 1:30,000, or 0.7 statute mile to an inch. The sheets thus far issued are very fine specimens of cartographic art. The Paris sheet has just been completed, and was about to be placed on the market.

All who are interested in this new map should read the detailed articles upon it published in the *Annales de Géographie* in March, 1904, by Prof. Vidal de la Blache, and in May, 1905, by Mr. Emm. de Margerie. The first article is accompanied by a specimen sheet of l'Isle-Adam; the second has a map showing the progress of the work. Nine sheets of the environs of Paris were published last year. The surveys are being conducted in the field on a scale of

1:10,000 in regions of moderate relief and of 1:20,000 in mountainous regions. Surveys on these scales are to form the basis of the new cartography of France. It is probable that the next publications will be maps of the environs of the other large cities of the country. It is estimated that the cost of producing the entire map will be \$6,000,000; and as the appropriations thus far voted are small, it is likely that the progress of the map will be slow.

**FOUR-COLOUR PRESS FOR MAPS.**—Among the comparatively new machines used in map production is a four-colour press employed in one of the largest commercial map houses in Paris, which prints a map in four colours simultaneously at one feed by a very ingenious device which prevents the rollers of the wrong colour from touching the plate.

**NINTH INTERNATIONAL GEOGRAPHICAL CONGRESS (GENEVA).**—The Committee on Organization held a meeting on the 2nd of June.

Three Honorary Presidents have been named: The President of the Swiss Confederation, in office in 1908; the President of the Council of State of Geneva, for the same year; and H. M. the King of Rumania.

The list of Honorary Vice-Presidents includes the four surviving Presidents of previous International Geographical Congresses.

The Circular of Invitation and the text of the General Preliminary Arrangements will be published in November next.

**A MAGAZINE FOR GLACIOLOGY.**—The news and literature of most of the earth-studies reach the interested public through journals or bulletins that are devoted to these specialties. Glaciology, however, has been without an organ, in spite of its growing literature and the many specialists who for some decades have given much attention to it. This lack is supplied at last by the appearance of the *Zeitschrift für Gletscherkunde, für Eiszeitforschung, und Geschichte des Klimas*. The first number (May, 1906) is a handsome magazine of 80 pp. Dr. Eduard Brückner, Professor of Geography at the University of Halle on the Saale, is the editor, and the publication is the organ of the International Glacier Commission, with Professors Forel, J. Geikie, Nansen, Penck, and H. F. Reid, Mr. Charles Rabot, and other well-known geologists and glaciologists associated in the management. The magazine, which is to appear at intervals, with from four to five numbers in a volume, is priced at 16 marks per volume, and is handsomely printed in large type, with a number of diagrams and half-tone photographs. Four leading articles occupy, with an introductory announcement by the editor, 60 pages, a department of news, notes, and minor contributions to pages, and there are five pages of concise book reviews, and a bibliography, in which it is expected to cover the literature of glaciology and historical climatology, beginning with 1905. These departments will appear in every number.

Two of the leading articles are in German, one in French, and one in English, the latter being by Prof. J. Geikie, on "Late Quaternary Formations of Scotland," in which he presents new evidence for the accuracy of his belief that the formations which in the British Islands are classed as "Postglacial" afford striking evidence of climatic oscillations and that these formations cannot be separated from the glacial series.

One of the most striking illustrations is a view of the Antarctic inland ice as seen from the Gaussberg. It accompanies a long note by Dr. Drygalski on the movement of the Antarctic inland ice, in which he says that in King William II.

Land the inland ice, at the point of observation, was moving to the sea at the rate of 50 meters in five months, or about a third of a meter a day; he contrasts this with the movement of 18 meters a day of a Greenland ice stream between rock walls, while the former is a movement of ice over a comparatively even surface.

This new publication makes a decidedly favourable impression as a scientific journal of high rank, carefully edited, and produced in the best manner.

#### OCEANOGRAPHY.

DRIFTS IN THE PACIFIC OCEAN.—For a number of years the Government of New South Wales has been distributing to shipmasters trading to Sydney printed papers to be enclosed in bottles and thrown overboard. A considerable number of these blank forms, filled out by those who cast them into the sea or who recovered them, has been returned to Sydney. Mr. H. A. Lenehan publishes in the *Journal and Proceedings* of the Royal Society of New South Wales for 1904 the latest of a series of eight papers on these drift returns. Several valuable returns are recorded, the most interesting of which relates to a paper that was cast adrift within a few miles of the California coast, probably just outside the influence of the coastal inset, and travelled a distance of 11,350 miles, nearly half circumnavigating the globe before reaching its terminal point on the island of Boillon in the Java Sea. It is the first record received of drift in that part of the North Pacific Ocean. It is supposed that when the paper was put overboard on July 19, 1901, winds were blowing off the land and so drove it into the great North Pacific drift. It was carried to the south, and thence along to the westward, in latitudes between  $0^{\circ}$  and  $20^{\circ}$  N., when it probably got into the north equatorial current. From thence it passed through Malacca Straits to the spot where it was discovered.

Another paper had both a long and rapid drift. It was put into the sea a few degrees south of the equator in long.  $88^{\circ} 47'$  E. and threaded its way through Torres Strait to the Solomon Islands, passing through a veritable network of reefs and islands. The drift was 4,830 miles at a daily rate of 21.6 miles, the fastest recorded. Six papers from the Indian Ocean have been found on the coast of Africa, five of which followed well-known courses; but one, which from what is known of the drifts might be supposed to be destined for the coast of Cape Colony, was picked up at Mombasa.

In the Atlantic Ocean, three papers thrown overboard in the Bay of Biscay, south of the Canary Islands and west of St. Helena, respectively, found their way to the West Indies, the drift farthest north being the slowest and the one south of the equator the fastest. There were several important records from the Southern Ocean, some of the papers reaching the Australian coast, one making its way to the north of New Zealand near Kaipara Heads and another to Aneiteum, New Hebrides. The fastest drift was 9.7 miles a day and the slowest at a daily rate of 1.4 miles. Some anomalies were found in the Great Australian Bight, where the charts show that the drift is to the eastward; yet three of the papers had a noteworthy westerly set.

THE EARLIEST ITALIAN PUBLICATION ON OCEANOGRAPHY is, according to Roberto Almagia, the *Relazione del Mare*, written by Giovanni Botero and printed at Rome in 1599. A short but comprehensive (for its time) treatise of what was then known or believed to be known concerning the sea and its relations to the land and the atmosphere, including the tides, which Botero says are generally

believed to be due to the moon. A number of other phenomena related to the ocean are discussed in the little treatise, which the critic describes with care, impartiality, and adequate knowledge of the subject.—(*Bollettino della Società geografica Italiana*, Serie IV, Vol. VII, 4. April 1906, *Comunicazioni e Relazioni*.)

OCEANOGRAPHICAL MUSEUMS.—*The Geographical Journal* (June, 1906) says that the Prince of Monaco has decided to transfer to Paris the Oceanographical Institute founded by him at Monaco, and has set apart the sum of \$800,000 for its maintenance, besides endowing it with the Museum established by him and all the scientific appliances connected with it. The management of the Institute, which will be placed on ground acquired with the Prince's aid by the University of Paris, will be vested in an international committee of specialists.

AN OCEANOGRAPHICAL MUSEUM has also been established in Berlin in connection with the Institut für Meereskunde. It was opened on March 5. The Museum is divided into four sections: (1) A collection illustrating the Imperial Navy, containing pictures and models of warships, and specimens of guns, torpedoes, etc.; (2) a popular and historical collection illustrating the progress of navigation, with models of modern and primitive vessels, life-saving apparatus, etc.; (3) a collection of instruments, etc., used in the study of the ocean and its contents, with numerous models showing the height of the continents and the depths of the ocean, the weight and volume of land and sea respectively in relation to those of the whole earth, the amount of salt in the sea, etc.; (4) a collection illustrating the biology of the ocean and the fisheries, with examples of the products of economic value.

INSTRUCTION IN OCEAN RESEARCH.—The Oceanographical Institute of Bergen Museum announces that courses in ocean research will be held, as last year, in Bergen, Norway, during the university vacation from Aug. 8 to Oct. 15. The courses will consist partly of lectures, partly of practical instruction and assistance in laboratory work. During the excursions the use of appliances and instruments will be demonstrated. The lectures are so arranged that all may be attended by students who desire to do so. Dr. A. Appellöf will lead examinations of forms of the fish and invertebrate animals in the fiords and North and Norwegian Seas, lecture on the distribution of bottom fauna, and conduct excursions in the adjacent fiords. Dr. D. Damas will have charge of animal plankton and ordinary plankton biology and Mr. E. Jörgensen of plankton algæ. Mr. B. Heland-Hansen will give instruction on methods of oceanographic investigations, review the results of researches in north European waters, and lecture on theoretical oceanography. Docent C. F. Kolderup will lecture on ocean-bottom deposits and glacial and post-glacial deposits in Norway. Those who wish further information should write to the Institute at Bergen.

#### POLAR.

CAPTAIN MIKKELSEN'S EXPEDITION.—A letter from Captain Mikkelsen, dated June 23, announces the arrival of his Arctic party at Dutch Harbour, Unalaska Island, at the entrance to Bering Sea. On the way north the party spent ten days at Kadiak Island. The ship which Captain Mikkelsen purchased has given much satisfaction, as she is a fine sea boat and easily handled. At the time of writing, Captain Mikkelsen expected to go north to Cape Deshnef, Siberia, to purchase dogs



and then to go to Nome, from which place he hoped to sail for the Arctic Ocean on or about July 25.

THE PRINCE OF MONACO IN ARCTIC WATERS.—The Prince of Monaco left the Mediterranean on his yacht, *Princesse Alice*, on June 20, to spend considerable time in researches in and near Spitsbergen. His studies will include the sea depths, the upper air, and the interior of Spitsbergen. He will investigate the upper atmosphere by means of balloons, as in his experiments in the region of the northeast trades last summer, and will also send one or more parties to explore the interior of Spitsbergen.

## NEW MAPS.

### AFRICA.

EGYPT.—Egypt. Scale, 1:50,000, or 0.7 statute mile to an inch. Sheets: I-I N.W.; I-II S.E.; II-I S.E.; II-II S.E.; III-II S.E.; XXIV-VII S.E.; XXIX-VIII S.E. Survey Department, Cairo, 1906.

These are the first sheets of the topographical map of Egypt on a scale of 1:50,000 which the Survey Department has just begun to publish. They delineate regions along or near the Nile in the Mudirias of Giza, Qena, and Aswan. The sheets within the map borders are 18 by 20 inches. The hydrography, including the canals, is in blue, the names and all cultural features, excepting the canals, are black, and the desert areas white. The information is detailed and very clearly expressed. The Mudiria and Markaz boundaries, canals, villages, banks, roads, and bench marks are given. The nomenclature is both in English and Arabic. The new map will be a great addition to the cartography of Egypt.

GERMAN SOUTHWEST AFRICA.—Farm Übersichtskarte von Teilen der Bezirke Windhuk und Karibib. Scale, 1:200,000, or 3.1 statute miles to an inch. Prepared in the Imperial Land Survey Office, Windhuk. *Mitteil. v. Forschungsreis. u. Gelehrt. aus den Deutsch. Schutzgeb.*, Vol. 19, No. 2, Berlin, 1906.

These land holdings are devoted almost wholly to grazing, and many have an area of thirty to forty square miles. The names of the farms and the farm boundaries are distinguished by green, watercourses in blue, topography in brown, and elevations in figures.

TOGO.—Karte von Togo. Scale, 1:200,000, or 3.1 statute miles to an inch. (Dr. Kete-Krasmichi.) *Mitteil. v. Forschungsreis. u. Gelehrt. aus den Deutsch. Schutzgeb.* Vol. 19, No. 2, Berlin, 1906.

Another sheet of the map of Togo. It gives much detail concerning large districts, but shows that the courses of many tributaries of the Volta River have not yet been learned, excepting where roads cross them. The roads connecting white stations, projected roads, native paths, official and mission stations, fords and bridges, and much other information are given.

TRANSVAAL COLONY.—Map to illustrate the Physical Features of the Transvaal. Scale, 1:300,000, or 47.35 statute miles to an inch. By Tudor G. Trevor. *Geog. Jour.*, July, 1906, London.

Some physical maps of Africa have failed to give a clear idea of the areal extent of the three distinctive divisions of the country according to elevation: the High,



Middle and Low Veld and the slopes. This map differentiates them by brown tints, marks the edge of the escarpment that partly surrounds the High Veld, and gives two profiles through the Transvaal from south to north and from west to east. In his accompanying article Mr. Trevor includes the High and Middle Veld in the plateau region and marks as the slopes those areas that lead up from the Low Veld to the plateau. He estimates that the plateau country occupies 32.4, the slopes 23, and the Low Veld 44.6 per cent of the Transvaal surface.

#### AMERICA.

##### U. S. GEOLOGICAL SURVEY MAPS.

Geologic Atlas of the United States, Washington, D. C., 1906. No. 134. Beaver Folio, Pennsylvania. Scale, 1:62,500. This quadrangle forms a part of the Appalachian province. Its western boundary is about 1 mile from the Ohio State line. Bituminous coal is an important resource.

No. 136, St. Mary's Folio, Maryland-Virginia. Scale, 1:125,000. The entire width of Chesapeake Bay, with the adjoining shores of Maryland and about 1 square mile of Virginia, are included in the quadrangle, which forms a part of the Atlantic Coastal Plain province. The economic products are clays and road materials.

No. 137, Dover Folio, Delaware-Maryland-New Jersey. Scale, 1:125,000. A part of the Atlantic Coastal Plain province occupying the northern part of the long peninsula which extends from the headwaters of Chesapeake and Delaware Bays to Cape Charles.

No. 138, Redding Folio, California. Scale, 1:125,000. Includes a little less than one-fourth of the area of Shasta Co. in northern California. This county has long been known for its mineral products, copper, gold and silver being most important. The larger part of the mineral values of the county now comes from this quadrangle or near its borders.

##### U. S. HYDROGRAPHIC OFFICE CHARTS.

Pilot Chart of the North Pacific Ocean, August, 1906.

The reverse has a chart showing the track of typhoons in East Asiatic waters. The velocity along the track in low latitudes is about 17 miles an hour; in middle latitudes, 5 to 10 miles an hour; in high latitudes, 20 to 30 miles an hour.

ALASKA.—Geologic Sketch Map of the Rampart Region, Alaska. Approximate scale, 16 statute miles to an inch. By L. M. Prindle and F. L. Hess. *Bull.* No. 280, U. S. Geol. Survey, Washington, 1906.

The Rampart region is one of the four important gold-producing districts of the Yukon-Tanana district. This map, while only approximately correct, represents with fair accuracy the general relations of the narrow belt of country which it includes to the larger area of which it is a part.

#### ASIA.

CHINA.—Postal Map of China, 1905. With insets of the Newchwang and part of the Canton districts. *Returns of Trade*, 1905, Imperial Maritime Customs, Shanghai, 1906.

Shows in colours the post offices, limits of postal districts, and postal connections by courier, steamer or launch, and railways. Among the 37 postal districts there are a dozen as large as most countries in Europe. Only a beginning has yet been made in developing the postal service; but this convenience has taken hold of the people, and its prospects are most encouraging.

## EUROPE.

GERMANY.—Hafenanlagen in Bremen. Scale, 1:5,000, or 0.07 statute mile to an inch. Deputation für Häfen und Eisenbahnen zu Bremen, Bremen, 1905.

GERMANY.—Hafenanlagen in Bremerhaven. Scale, 1:5,000, or 0.07 statute mile to an inch. Deputation für Häfen und Eisenbahnen zu Bremen, Bremen, 1905.

The large scale of these maps, in colours, of the harbours of Bremen and its outport Bremerhaven make it possible to present the detailed plans of the two ports very clearly. All the dockage and basins, with railroad connections, are shown, and the Bremerhaven sheet has an inset giving the tonnage each basin will accommodate, and its depth at high and low water. The harbours, shipping, commerce tributary to them, and the free ports are described in the accompanying letterpress.

ICELAND.—Carte de l'Île Islande. Scale: 50,000, or 0.7 statute mile to an inch. Sheets: 49 N. E. Vestmannaeyjar; 59 N. E. Portland; 68 S. E. Skaptártunga; 69 N. E., N. W., Hjörleifshöfði; 77 S. E. Lómagnúpur; 78 N. E., N. W., S. E., S. W., Kirkjubæjarklaustur; 79 N. W., Grímsstadir; 87 N. E., N. W., S. E., S. W., Oraefajökull; 88 N. E., N. W., Ingólfshöfði; 96 S. E., Heinaberg; 97 N. E., N. W., S. W., Kálfafeisstadur; 106 S. W. Lon-Nágrenni Reykjavíkur og Hafnarfjardar. Scale: 1:25,000, or 0.3 statute mile to an inch. Reykjavík. Scale: 1:5,000, or 0.7 statute mile to an inch. Hafnarfjörður. Scale: 1:5,000. Presented by the Topographic Section, Copenhagen, 1906. (Price, 1 crown per sheet.)

A detailed survey of Iceland was begun in 1902, and these sheets are based upon that survey, which, thus far, has embraced only areas contiguous to the south coast, Reykjavík, Hafnarfjörður and their environs on the west coast, and the Westmann Islands. The funds have been supplied jointly by the Danish and Icelandic Governments, and it is hoped that the survey will be continued. It is expected to issue the map on the scales of 1:50,000 and 1:100,000. The map of the whole island on the latter scale will comprise 115 sheets, and on the larger scale, which is that of the sheets thus far issued, the number of sheets will be 460. The sheets are finely produced and the scales permit a large amount of detail from plans of the towns to paths, farm boundaries, cultivated fields, pastures, and water mills. The contour interval is 20 meters, the glacial as well as the land slopes are shown, and the plan of Reykjavík names the streets and all important places, and shows in red every building in the city.

SAXONY.—Volksdichte-Schichtenkarte des Königreiches Sachsen, nach der Zählung von 1 Dezember 1900. Scale, 1:528,000, or 8.3 statute miles to an inch. By H. Wiechel. Supplement to the *Zeitschrift* of the Royal Saxon Statistical Bureau, 1904.

Colours and contours are ingeniously used to show various densities of population, much as they are used by photographers to show differences of elevation. Thus the distribution of population is denoted in a more scientific and detailed manner than on the ordinary density-of-population map.

SCOTLAND.—Répartition Géographique des grandes Associations végétales dans les Highlands d'Ecosse. Scale, 1:633,600 or 10 statute miles to an inch. By Marcel Hardy. *Annales de Géog.*, No. 81, Paris, 1906.

Illustrates an article by Mr. Hardy on the vegetation of the Scottish Highlands. The map is by Bartholomew, and shows by tints the distribution of cultivation, dunes, heath, moor, pasture, Alpine areas and rock ridges, and the oak, birch, and coniferous forests.

## EAST INDIES ARCHIPELAGO.

THE PHILIPPINES.—Manila. Plan of Proposed Improvements. Accompanies Report to the Secretary of War, 1905.

This is a black-and-white map illustrating the proposed improvements described in the report by architects Burnham and Anderson. The map shows the proposed development of water front and the distribution of parks and parkways by which it is expected to supply adequate means of recreation to every quarter of the city; also the sites selected for future public buildings and the projects for the improvement of waterways. Another plan in the same report shows the proposed sea boulevard in Manila bay. It is to be a wide, splendid thoroughfare along the shore of the bay from Manila to Cavité.

THE PHILIPPINES.—Map of Batan Island. Scale, 1:100,000, or 1.5 statute miles to an inch. Coast and Geodetic Survey of the Philippines, 1903.

Illustrates Lieutenant Wigmore's report on the examination of coal deposits in Batan Island. The position of the outcrops is indicated.

## ATLASES.

ATLAS OF THE WORLD'S COMMERCE.—Compiled from the latest Official Returns at the Edinburgh Geographical Institute. Edited by J. G. Bartholomew. (Part 6.) George Newnes, London, and Frederick Warne & Co., New York, 1906.

One of the two map sheets is devoted to silk, furs, and feathers, and the other to gold. The silk-and-furs map shows in purple and red tints the areas producing silk, those yielding sufficient silk for exporting, regions where the silk worm is found wild, and the areas of the sea fisheries. Scattered over the map are the names of the chief fur-bearing animals in red. This is perhaps the first time a map has been compiled to show the distribution of the feather industry. Three tints show the distribution of the eider duck, ostrich and rhea, and the names of birds whose feathers form an important article of commerce are distributed in red. Domestic birds are not included.

The gold-mining sheet shows the world distribution of the industry in red and the chief lines of export in blue. Six smaller maps show on a much larger scale the especially productive districts. All these maps are illuminative and excellent, except that entitled Alaska. The title is a misnomer, for fully nine-tenths of the gold areas shown are on the Canadian side of the border. The regions that produce nineteen-twentieths of Alaska's gold—viz., the Seward Peninsula, the Koyukuk, a part of the Tanana mining region, Cook Inlet, and the great quartz-crushing area on Douglas Island are outside the limits of the map, and the curious mistake is made of colouring a part of the Malaspina Glacier as a "Gold District." This mistake is repeated on the general map, but otherwise the distribution of Alaskan gold is shown as well as the small scale permits. The reverse of the sheets is filled with discussion, statistics, and diagrams relating to the commodities mapped. The description of the commodities of commerce is carried forward from "Leathercloth" to "Milk," with diagrams in the text.

## BOOK NOTICES.

**Ferguson's Ceylon Handbook and Directory, 1905-6.** xi and 1364 pp. and Index. A. M. & J. Ferguson, Colombo, 1905-06. (Price, £1.)

The present edition of this excellent hand-book is, as usual, filled with practically every kind of information to answer all sorts of inquiries about this remarkable island. The most novel and, for the world at large, the most interesting pages in this edition are those devoted to the rubber-planting industry—for Ceylon is doing more than almost any other region to demonstrate the practicability of rubber cultivation. The frontispiece is a photograph of Pará rubber trees taken in the Government gardens at Henaratgoda. The trees have grown to large size; and though the oldest and largest of them (28 to 29 years) are not shown in the picture, it gives a good idea of the thrift of the Pará rubber tree in Ceylon.

Rubber-planting began twenty-nine years ago; but, at first, little attention was paid to Pará or Mexican rubber, as the hardy Ceará nearly monopolized attention. In recent years a great deal of interest in the Pará rubber tree (*Hevea Brasiliensis*) has developed. Until 1898 rubber-planting was represented by only about 750 acres; but by the middle of 1901 the acreage was about 2,500, and in June, 1904, there were 11,000 acres. Planting has gone on with remarkable rapidity during the past year, and the estate returns show nearly 40,000 acres. It was at first estimated that not more than 10,000 acres in Ceylon would be available for Pará rubber, but it is now known that the range will be much more extensive. In 1903 the tree was flourishing at a height of over 3,000 feet, and it is now doing well up to 4,000 feet. The crop of 1893 was 2,792 pounds. It kept increasing every year, till in 1904 it was 77,212 pounds. The crop of half of 1905 was 51,520 pounds.

**John Chinaman at Home. Sketches of Men, Manners and Things in China.** By the Rev. E. J. Hardy. 335 pp., numerous Illustrations and Index. Imported by Charles Scribner's Sons, 1906. (Price, \$2.25.)

The author was a chaplain for three and a half years in the British forces at Hongkong. From time to time he was absent on leave in China, and during his sojourn in the country he observed and heard everything he could about the habits and customs of the people. The first six chapters contain descriptions of some of the leading cities—Hongkong, Tientsin, Peking, Canton, Swatow, Amoy, Foochow, and of journeys on the West and Yangtse Rivers. Fully three-fourths of the book is given to the life of people, their food, medicines, clothes, houses, gardens, servants, betrothal and marriage, death and burial, boys, girls, education, manners, the Government, religions, superstitions, and other topics, including missionaries. The book is filled with incident, and the simple and interesting style in which it is written is well adapted to leave a vivid impression of the everyday life of the Chinese.

We appear to the Chinese, in all respects, to be as singular and eccentric in our customs as they have appeared to many of us. When we criticise the Chinese for worshipping their ancestors, they retort that we worship our wives. The

Chinese strongly objects to being looked at through glasses, and the native wearing spectacles who does not remove them when a visitor comes into his room would be thought very rude. The Chinese accuse us of morbid unrest; they say we do not live, because we are so intent upon increasing the means of living that we are always discontented. How can we put either milk or sugar in our tea when they destroy bouquet and flavour? The writer goes below the surface of many things Chinese, and we are not only introduced to the aspect of life among them but also learn something of the philosophy which underlies their doings and prejudices.

**Heroes of Discovery in America.** By Charles Morris. 344 pp., 12 Illustrations. J. B. Lippincott Company, Philadelphia, 1906. (Price, \$1.35.)

Unfortunately, this book seems to have been prepared without the geographical instinct that seizes upon the most significant and vital facts and without sufficient striving after accuracy. An author who presents Robert E. Peary and Roald Amundsen, at present the most-talked-of Arctic travellers, as "Robert B. Peary" and "Roald Amundsen" has only himself to blame if his facts are thought to have been compiled with inadequate care. Such statements as this: "Amundsen forced his vessel across the Northwest Passage from the Atlantic to the Pacific" are of little value. Whereabouts was this channel he followed? For any intimation this book gives about the matter Amundsen's route might have been north instead of far south of McClure's.

**The Euahlayi Tribe. A Study of Aboriginal Life in Australia.** By K. Langloh Parker. With an Introduction by Andrew Lang. xxvii and 156 pp., 6 Illustrations, Glossary and Index. Archibald Constable & Company, Ltd., London, 1905. (Price, 7s. 6d.)

Mrs. Parker's contribution to the study of the manners, beliefs, and legends of the Australian aborigines is the result of her observation from childhood of the Euahlayi tribe in the northwestern part of New South Wales. She had unequalled opportunities for the study of the women and children, in which respect the male scientific observer is usually at a great disadvantage. The Australian natives are regarded "as the most backward of mankind, having no agriculture, no domestic animals, and no knowledge of metal-working. Their weapons and implements are of wood, stone, and bone, and they have not even the rudest kind of pottery. But though the natives are all, in their natural state, on or about this common low level, their customary laws, ceremonials, and beliefs are rich in variety."

None of Mrs. Parker's informants had ever been under the influence of missionaries, and yet these primitive people, in a limited and modified form, hold a belief in reincarnation, and have other ideas and usages that are deserving of close study. Mrs. Parker's intimate acquaintance with them gave her a great advantage in collecting their legends. She says that if the inquiring white is a stranger a legend will be told him as quickly as possible, and in a half-contemptuous way, as much as to say, "What do you want to know such rubbish for?" But if the native *raconteur* knows the visitor well, and feels that he is really interested, the stories will be told as he would tell them to his family, giving them a new life and adding considerably to their poetical expression.

Mrs. Parker has some unusual advice for missionaries. She believes that before they go out to teach they should acquaint themselves with the making of

the world's religions and particularly with the one they are going to supplant. They will probably find that elimination of some savagery is all that is required, leaving enough good to form a workable religion that will be understood by their barbarous pupils:

If the missionary ignores their faith, thrusting his own, with its mysteries which puzzle even theologians, upon them, they will be but as whitened sepulchres or, at best, parrots.

**Old Maps and Map Makers of Scotland.** By John E. Shearer. viii and 86 pp., Illustrations, Maps and Index. R. S. Shearer & Son, Stirling, 1905. (Price, 10s.)

This handsome volume describes a large number of maps of Scotland from the time of Strabo, about 20 B.C. to 1832. Strabo was the first to map that region; but he showed it as an island—a mistake that was committed by many later map-makers. Ptolemy's map of 150 A.D. did not show Scotland as a separate island, but this mistake was very common on maps of the thirteenth, fourteenth and fifteenth centuries. The author produces, chiefly on a small scale, twelve of the early maps, the most important of which are those of Ortelius in 1570 and Robert Gordon in 1653. The map published by Ortelius was the first printed map of Scotland.

**Chronicles of London.** Edited with Introduction and Notes by Charles L. Kingsford. xlviii and 368 pp., Appendix and Index. Clarendon Press, Oxford, 1905. (Price, 10s. 6d.)

The introduction contains an account of the various Chronicles of London which were compiled by aldermen or other citizens from about the twelfth century and gradually lengthened and became more important in the following centuries. Together they cover a period of 320 years—from 1189 to 1509. This book contains the most detailed account of the Chronicles yet printed and the text of three of them. The critical and explanatory text is very full, and the Chronicles are now presented to historical students in convenient and edifying form. The Notes deal chiefly with matters illustrating the history of London or the text of the Chronicles, and the Glossary explains archaic or obsolete words and those that are used in an uncommon way. These three Chronicles are typical specimens of the English language in a transition state, and illustrate its progressive development from archaic passages in the Cleopatra Chronicle to the most modern part of Vitellius, written in the opening years of the sixteenth century. A photographic reproduction of Ryther's map of 1604, one of the oldest plans of the city, forms the frontispiece.

**La France.** Par P. Vidal de la Blache et P. Camena d'Almeida. (Eighth Edition.) xxx and 543 pp., 23 Maps and Index. Armand Colin, Paris, 1905. (Price, 3.25 fr.)

A school book that was in its sixth edition in 1904 and reached its eighth in the following year evidently fills a need. The book differs much from our geographical text-books, and is more like our geographical readers, excepting that there is no special effort to "write down" to the level of the grammar grades. The forms of the land, hydrography, climate, industries, settlements, etc., in each geographical division are fused, as it were, into a well-compacted narrative with a kind of rounding off of the abrupt transitions which make so many text books very dull. At the end of each chapter is a "revision" or summary of its

main features. The colonies are also described, and a chapter is given to the military organization, the defence of the frontiers, and the routes leading to them.

**Round the World Geographical Readers. Europe.** By **W. Vere Mingard**. 295 pp., Illustrations and Maps. T. C. & E. C. Jack, London, [undated]. (Price, 1s. 6d.)

Emphasizes the chief geographical features of each country, and then simply describes the industries and most important towns. The plan of the book and its literary execution are to be commended for young readers. But the two introductory paragraphs are really unfortunate. The author says that while America contains loftier mountains, longer rivers, and larger lakes, yet it cannot compare with Europe in importance. Then he sets forth the reason why:

The influence of mountains, rivers, coast-line, climate, character of the soil and many other natural conditions cannot be set aside; but far before these are the habits, skill and enterprise of the people who inhabit the country. Of what avail are fine bays, fertile soil, precious minerals and other advantages to men who do not know how to use them?

Europeans usually credit us with knowing how to use the natural advantages we possess.

**Between Capetown and Loanda. A Record of Two Journeys in South West Africa.** By **Alan G. S. Gibson**. xvi and 203 pp., 20 Illustrations, Appendix and Map. Wells, Gardner, Darton & Co., Ltd., London, 1905. (Price, 3s. 6d.)

The book has some geographical value for the glimpses it gives of development and conditions of settlement in southwest Africa, from the sandy plains of Cape Colony to Humpata, the chief Boer settlement in southern Angola, and at the three important ports of that Portuguese colony. Bishop Gibson's chief purposes were to visit the scattered families belonging to the English Church and to look for missionary opportunities among the native races; and most of his book is given to these topics. The first journey was made in 1901 and the second in the following year. He says that the Cape Mounted Police are now using camels for patrolling in the sand country of Cape Colony. He was much interested in comparing the language of the Ovaherero (who after his visit waged a long and desperate war with the Germans in German South West Africa) with those spoken by the Kafir tribes in the east of Cape Colony. He found that some words in their various languages are almost the same, and he suggests that any one who really masters any Bantu language may, without great difficulty, acquire any other of the same family. Windhoek, the capital of German South West Africa, owes its origin to the springs that fertilize the surrounding country, and he found it attractive with its hills, trees, pretty gardens, and good buildings. Humpata is the centre of the Boer life in southern Angola, and is the outcome of the famous trek of Transvaal Boers in 1875-1880. About 1,000 Boers are now living on this Huilla plateau, some 6,000 feet above the sea, where they raise fine field crops and fruit and have abundant pasturage. The two great drawbacks are the lack of a market and the diseases which affect cattle and horses.

**By-Paths in the Balkans.** By **W. V. Herbert**. xiii and 269 pp., Glossary and Index. Chapman & Hall, Ltd., London, 1906. (Price, 10s. 6d.)

A collection of impressions and incidents during the author's sixteen months' journey in Balkan countries in 1903-5. His travels were chiefly in Bulgaria, Rumania, and Servia, though he spent some time in adjacent lands. He was



brought into rather close relations with the common people, and, in fact, when his money gave out, he worked for a time in a restaurant, and had other opportunities for coming into touch with everyday life. He naturally saw, heard, and felt many things that are outside the experience of the ordinary traveller, and the result is that his book contains much that is new about regions that have not yet been written to death.

Captain Herbert says that maize, wheat, and vineyards now cover the battle-field of Plevna, where about 100,000 soldiers sleep their last sleep. The chapters on the Gypsies, who are more in evidence in the Balkans than in any other land, are very informing. There are about 700,000 of them in the European Orient, and at least 250,000 are habitual nomads. The districts reserved for them in towns and cities are called *mahallahs*, which are always composed of dirty hovels in narrow, crooked lanes. Constantinople has several mahallahs, with an aggregate population of 10,000. The largest in Bulgaria, at Sofia, contains 3,000 souls, and that at Plevna 2,500. The Gypsy professes ostentatiously the religious faith of the country in which he happens to reside or travel, and so the nomadic families are likely to change from Islam to Greek Christianity and *vice versa* a dozen times in the year. The Gypsy is considered by Christian, Jew, and Mohammedan as an unclean outcast, with the result that he has no social relations with other peoples and has remained pure in race. These people have no education, but every large band usually has one person who can read and write Turkish and acts as professional letter-writer.

**Benares the Sacred City. Sketches of Hindu Life and Religion.**

By E. B. Havell. xiii and 236 pp., and 79 Illustrations. Blackie & Son, Ltd., London, 1905. (Price, 12s. 6d.)

The second half of the book is given to a description of Benares and of its environment, especially along the banks of the Ganges. The purpose of the author is not mere description, but to convey to the reader an adequate conception of the religious ideas and beliefs which millions of East Indians associate with this city. Benares was the birth-place both of Buddhism and Brahminism, and, as the writer says, the imaginative and artistic side of the Indian religions can be observed in few places so well as in this sacred city and its neighbourhood. For this reason Benares is very prominent in the author's clear and intelligible outline of Hindu ideas and religious practices.

**Wirtschaftsgeographie. Mit eingehender Berücksichtigung Deutschlands. Von Dr. Christian Gruber.** x and 235 pp., 12 diagrams and 5 maps. B. G. Teubner, Leipzig, 1905. (Price, M. 2.40.)

This is a practical text-book on economic geography. Its author has taught the subject in Munich for nineteen years. It closely connects cause and effect, and in this respect is in advance of nearly every other German text-book on the subject. An outline of the chapter on Austria-Hungary will give an idea of Dr. Gruber's method of treatment. He first considers the influence of the empire's geographical position in Europe upon its industrial conditions. Then he treats of the influence upon trade exerted by the shape of the empire and by the conditions along its boundaries, giving many illustrations, as, for example, two rivers, the Elbe and the Danube, both of which cross the frontier, one of them providing a cheap freight route between Austria and north Germany and

the other between Austria and South Germany. The empire is next studied as a land of sharp geographical contrasts, and the influences of these contrasts, of mountain and plain, these differences in climate, etc., are indicated. The next section deals with the importance of the empire, the adequacy of its communications, and the distribution and nature of its commerce; and, finally, the author considers the natural industrial divisions of the country—the Alpine lands (including the eastern Alps and a large part of Austria), the Karst lands (Carniola, Croatia, Slavonia, Dalmatia, Herzegovina), the Sudetic lands (Bohemia, Moravia, and Austrian Silesia), and the Carpathian lands (Hungary, Galicia, and Bukovina), showing the characteristics of production and trade in each of these regions.

About half the book is given to the German empire, the other European states also having considerable space, while the rest of the world is rather summarily treated. The book does not pretend to deal with all the phases of the subject; for example, there is no section devoted to the description of commercial commodities, but as far as it goes it is one of the most suggestive, helpful, and interesting text-books yet written in this department of geography.

**Fasciculi Malayenses. Anthropological and Zoological Results of an Expedition to Perak and the Siamese Malay States, 1901-1902. Undertaken by Nelson Annandale and Herbert C. Robinson, under the Auspices of the University of Edinburgh and the University of Liverpool. Zoology. Part I.** Published for the University Press of Liverpool by Longmans, Green and Co., 39 Paternoster Row, London, New York and Bombay, 1903. 4to, ll. 5, pp. 1-200, pll. i-x.—Mammals by J. Lewis Bonhote, M.A., F.Z.S. Pp. 1-45, pll. i-iv. Batrachians and Reptiles, by G. A. Boulenger, F.R.S. Pp. 127-176, pll. v-x.

Mr. Bonhote's "Report on the Mammals" of this important expedition is a most valuable contribution to the Mammalogy of the Malay Peninsula. The collection, as worked out by Mr. Bonhote, numbers 64 species, of which 8 are described as new; nearly a dozen others, mostly doubtfully identified, are mentioned, on the basis of the collectors' field notes. The 64 species represented by specimens include 3 monkeys, 1 lemur, 10 carnivores, 4 insectivores, 16 bats, 11 squirrels, 10 rats, 2 porcupines, 1 antelope, 4 deer, 1 pig, 1 porpoise, and 1 pangolin. This is a very good showing, considering that the collecting of mammals was incidental to the general work of the expedition. The collector's field notes on the habits and distribution of the species add greatly to the value of the report. In working out the species of *Mus*, Mr. Bonhote found it necessary to examine, as far as possible, all the rats of the Oriental region, and he has incorporated the results in the present paper (pp. 32-38), for the benefit of future investigators of this difficult genus. He gives a synopsis of the species, dividing them into seven groups and three additional sub-groups, four of which, for practical purposes, are "of almost generic value, although showing no characters of sufficient importance to enable them to be generically separated." A list of nearly one hundred species, with their places of occurrence, follows, and some further distinguishing characters for many of the groups and species. The four excellent plates contain colored illustrations of *Sciurus robinsoni* (pl. i), *Mus jalorensis* and *M. griseiventer* (pl. ii), the skull of *Hystrix grotiei* (pl. iii), and the skulls of five species of *Mus* and two species of *Sciurus* (pl. iv).

Dr. Boulenger's "Report on the Batrachians and Reptiles" includes 16 species

of the former (pp. 132-141, and plates v and vi) and 85 of the latter (pp. 142-176, plates vii-x), and forms a substantial addition to our knowledge of the Herpetology of the Malay Peninsula. Two species and one sub-species of frogs, two tortoises, a lizard, and a snake are described as new, whilst three additional species of lizards and one snake are here for the first time recorded from the region. Five species of frogs, two of tortoises, and three of lizards are figured in the six plates accompanying the report. There are also a few text figures. The collectors' valuable field notes constitute the greater part of the text. In an Appendix, Dr. Boulenger gives a "List of the Batrachians and Reptiles Recorded from the Malay Peninsula, South of Tenasserim." The list numbers 60 species of Batrachians, of which 16 have been added since the publication of Captain S. S. Flower's list in 1899; and 178 species of Reptiles, of which 30 species have been added since 1899, or during the last four years preceding the publication of the present report. The several orders are represented as follows: Chelonia, 23; Emydosauria, 3; Lacertilia, 71; Ophidia, 81.

J. A. A.

**Fasciculi Malayenses (Anthropology: Part I, 1903; Part II, 1904).** Published for the University Press of Liverpool (*as above*).

The two parts of this work are composed of a series of single contributions to the ethnology of the Malayan Peninsula, chiefly descriptive in character. The bulk of the first volume is taken up with data on physical anthropology. It deals further with the primitive beliefs and customs of the Patani fishermen, and with religion and magic among the Malays of the Patani States, the latter subject being continued in the second part. In this part Henry Balfour gives a report on a collection of musical instruments from the Siamese Malay States and Perak; besides this, some customs of the Malay-Siamese, and skeletons of the same people, are there discussed. A supplement gives a description of the itinerary of the expedition, which is accompanied by a map. In the first article of the first volume are contained a number of very interesting illustrations of decorative patterns, some with brief explanations of the ornaments and with occasional references to them in the text. It would certainly be very desirable if a special investigation of this promising subject could be carried on by the authors.

B. L.

**Militärgeographie der Schweiz, nebst kurzen Schilderung der Entstehung der Neutralität Savoyens und historischen Notizen über verschiedene Alpenpässe bearbeitet von Major Frölich.** Pp. II-120. Aarau, H. R. Sauerländer & Co. 1906.

Written specially for the use of Swiss officers and subaltern officers.—In the Preface the author makes the somewhat surprising statement that instruction in "home geography" is very deficient in Swiss military circles, owing to the short time allotted to officers for the purpose. There is perhaps no country in the world where national geography is so extensively and so efficiently taught as in Switzerland, where the public school pupils, male and female, are introduced to cartography at such an early age. If, however, one looks through the pages of this pamphlet (it is hardly a book, and it may be called a booklet for size and bulk), he understands the multitude and the intricacy of the problems which the military position of Switzerland presents to its eventual defenders, and justifies to some extent the complaint of the author.

Switzerland has, since its consolidation in 1847 and even before, made the detailed knowledge of its soil, from every point of view, accessible to outsiders in the

most liberal manner. Conscious of its weakness in numbers, it has withheld no so-called military secrets of a geographical nature. It knows perfectly well that in case of war with any of its neighbours it will always be at a great disadvantage in certain ways. Hence there is among the Swiss hardly any boasting, and no attempt at untimely provocation. Major Froelich tends to confirm that attitude through the minute data he gives regarding the defensibility of frontiers. He shows that an offensive from the side of Italy would enjoy superior facilities of concentration and convergence, or at least parallel advances, even into the Alpine barrier, and that on the Swiss side there are difficulties in the way of rapid movements of troops in considerable numbers. Worse yet are the conditions on the western frontier in case of French aggression. France has the open country with its numerous converging railroad lines; Switzerland has, practically, only lines that run *parallel* to its boundaries. The Jura is no barrier; on the contrary, from the French side it is an inclined plane, facilitating invasion. On the north, Major Froelich finds a better situation. It is true that approaches from southern Germany are through a rugged country, and that rapid concentration on that front from the German side is not so easy as, for instance, on the plains of Lombardy, which abut immediately against the southern Alps. Still we cannot fully share the optimism of the author on the defensibility of the northern frontier. The German Empire remains, from a military point of view, the most dangerous neighbour. Its perfect organization, its immediate proximity on a long line interrupted by salients from the Swiss side, which must be defended, and would constitute, therefore, an incumbrance in a struggle with an overwhelming adversary—all these features counterbalance the advantages which "military" geography may present on that frontier.

Aside from highly-important allusions to a defensive warfare carried on by the Swiss on the enemy's soil—a measure which General Dufour had already prepared for in 1856 against a (then imminent) Prussian aggression—Major Froelich turns to consider the gloomy picture of a defence of Switzerland to the "last ditch." He indicates the successive interior lines of defence, and in this he commits no indiscretion. Military authorities of adjoining nations are familiar with them, and there is nothing to conceal. When he reaches the "last ditch" it is with the final query, "Shall we, then, lose heart?" To this no reply can be given in words.

We consider the booklet of Major Froelich a timely and well-inspired one. It gives warning to a small nation, thoroughly organized for defence, of dangers that might be overlooked at the wrong time. An interesting notice of the early history of Alpine passes closes this sober, modest, and geographically valuable publication.

A. F. B.

**La Colonisation de la Nouvelle France. Étude sur les Origines de la Nation Canadienne Française. Par Emile Salone.** xii-468 pp. Paris, E. Guilmoto (1905). (Price 7.50 fr.)

With a not very complete knowledge of all the sources available for the history of Canada under French rule, or, at least, utterly ignoring some of them, like the works of Francis Parkman, for instance, Professor Salone of the Lycée Condorcet has still written an attractive and valuable book. Coming from a specifically French source, it has a specific colour that carries with it undeniable merit. The charges of brutality and cruelty against the English in their final conquest of New France may be somewhat exaggerated, especially as towards Wolfe. War, in his time, was much more pitiless than it has since become, and due allowance should always be made for the changes wrought by progress in methods of mitigation and relief.

The history of French Canada has been written so often and by such competent

writers that a new one might appear superfluous, were it not for the fact that the one before us relies exclusively upon French sources and tells, therefore, what might be called the "French side" of the tale. It shows more particularly the methods, or lack of method, pursued in France towards its North American colony, the wavering policy, the disregard for the necessities and welfare of the colonists. It is, as well known, not an attractive picture, but it is told by the author with absolute sincerity and apparent impartiality. The neglect of Canada by the home government contrasts strongly with the fortitude and heroism displayed by many of its representatives in the colony, and with the tenacity and self-sacrifice of the missionaries, among whom the Jesuits take the first place. The author omits, however, to state, what Parkman has so well shown, the great role played by the Iroquois in opposing the progress of Jesuit missions. That opposition was not consistently systematic, but it drew a boundary line which the missionaries, notwithstanding most heroic attempts, could not cross after a certain time. Had they been properly supported by the temporal power the outcome would have been different.

Towards the end of the French domination in Canada a rival arose in the more recent French settlements in Louisiana. Much more favoured by nature, this colony soon drew attention away from the cold and apparently inhospitable regions in the north. The climate of Canada always was one of the pretexts alleged in favour of abandonment. When Louisiana had become well settled and had won favour at home, the always disintegrating influence of Voltaire upon the mind of France turned openly against Canada and contributed to discredit it to a still greater extent.

The picture drawn by Professor Salo of the results of the work of education among the Canadian Indians is gloomy. Unfortunately it is true. While viewing things from afar, he still has penetrated the nature of the Indian in general, and the obstacles to his elevation *en masse* are properly recognized. Only one European nation has succeeded somewhat in raising the aborigines to a level above their primitive condition. This nation was Spain. The fact is usually denied, yet it is true. However varied the experiences of Spanish states in America have been since their independence, *there*, at least, the Indian has made some progress.

The book being historical and not geographical, accompanied by a single map and having one chapter devoted to the physical aspects of Canada, we congratulate the author on the production of a well-written and by no means indifferent contribution to the history of "northern" North America.

A. F. B.

**Algumas Cartas inéditas do Visconde de Santarem, com uma Introdução e Notas por Vicente Almeida d'Eça, S.S.G.L.**  
Lisboa, 1906.\*

This part of the correspondence of the distinguished Portuguese geographer and diplomat, now published for the first time, recalls the letters of Alexander von Humboldt which Ludmilla Assing published in 1860. Relations of cordial friendship existed between the two men during their lifetime, and Santarem died only two years before the great German scientist. The letters of Humboldt contain hardly anything of great value to science, whereas those of Santarem (addressed to his nephew, Count da Ponte, with the exception of two directed to Varnhagen von Ense) have more occasional bearing on geographic topics. On the subject of literature of the time when the letters of Santarem were written (1839-1852), they are fuller than the letters of Humboldt, but embrace only what has appeared in French (translations included) or other Romanic languages, whereas Humboldt includes allusions to almost

\* Published by the Sociedade de Geographia de Lisboa.

any idiom then extensively printed. Of chief interest are the letters of Santarem to Varnhagen (Dec. 8th, 1839, and Jan. 31st, 1840) for their relation to the controversy about Amerigo Vespucci. Among other things Santarem proves (from the map of Juan de la Cosa) that the Island of Fernando Noronha was discovered already in 1500 by the Portuguese, not in August, 1503, as Varnhagen admitted. The tone of these two letters is rather acrimonious.

Notices of older Portuguese books, almost unknown otherwise, and of many manuscripts of interest are dispersed through the letters. They are, like those of Humboldt, intimate correspondence, and resemble them greatly in style and in tone, which is most natural, since the two distinguished men were not only close contemporaries, but belonged to the same social circles, had the same scientific traditions to follow.

A. F. B.

**Lettres Américaines d'Alexandre de Humboldt. 1798-1807. Pré-cédées d'une Notice de J.-C. Delaméthérie et suivies d'un choix de documents en partie inédits.** Publiées avec une Introduction et des Notes par le Dr. E. T. Hamy. xxxix and 309 pp. and Map E. Guilmoto, Paris (1905).

This collection of letters consists of sixty-three numbers, mostly printed already, but scattered through scientific publications in French, German and Spanish, and now presented in the French language for a good and valid reason. The greatest number of them are originally in French, a language which Humboldt cultivated in preference to any other on account of his close relations to the French Government and scientific institutions, as well as to French men of science. As he states in a letter to Guizot in 1826 (see Appendixes, p. 302), he enjoyed the "noble hospitality of France for eighteen years," and consequently was much attached to the country and the people, while his great earlier works, even the "*Asie centrale*," were published in the French language. To this body of letters is added a no less valuable appendix (or rather, eleven Appendixes), including an Autobiography, his "Confessions," entrusted to Pictet, and kept by the latter, and notes on Humboldt by Boussingault. In these we find the following personal description of Humboldt at the age of fifty-five (1824)—"medium height, well built, white hair, an undefinable look, a spiritual, mobile face, slightly marked by small-pox contracted at Cartagena in the Indies. His right arm was paralyzed by rheumatism, resulting from sleeping on moist leaves on the banks of the Orinoco. When he wanted to write or offer his right hand, he lifted it with his left to the height required. The costume he wore was the same as at the time of the 'Directoire': blue coat, yellow buttons, yellow vest, breeches of striped material, top boots, the only ones found at Paris in 1821, white cravat, &c., &c." His apartments were then as modest as those he occupied in the last days of his life: "a small dormitory, a bed without curtains. Where he worked, four straw chairs, a big table of pine-wood, on which he wrote. It was covered with calculations in figures and logarithms. When that table was covered with ciphers, he would send for a carpenter to plane them off. Hardly any books: the TABLES of Callet, the CONNAISSANCES DES TEMPS." At the farewell dinner given by Boussingault, Humboldt appeared in silk stockings and a new hat, and surprised everybody.

In the Introduction Dr. Hamy justly observes that the leading idea of Humboldt, from the days of his youth on, was to establish the natural philosophy ("Physique") of our globe upon a solid basis. Hence his persistence in tracing the "casual connection of phenomena," and his final work, the "*KOSMOS*," the only one of magnitude composed by him in German.



The "Notice of a Journey to the Tropics," by Delam  therie, which follows upon the Introduction, is a most valuable document for a knowledge of Humboldt's travels and achievements on the American continent. It was written in 1804, when Humboldt and Bonpland had just returned. Humboldt himself qualified it as "very exact," and, with the map of his American travels, it gives a very clear idea of the routes followed by him and Aim   Bonpland on the South-American continent, of his two visits to the Antilles, his journeyings in Mexico, and his visit to the United States. Thence the explorers returned to Europe after an absence of five years and two months. During that time part of the collections sent to Europe had been lost in a shipwreck; still Bonpland could, upon his return to Paris, arrange a herbarium containing six thousand species of American plants, and thirty-five boxes of collections came with the travellers, in August, 1804, to France. The manuscripts and drawings were all saved.

Turning now to the letters proper, they are certainly important corollaries to the works on America by the great German scientist. While, as Dr. Hamy intimates, they do not tell much that is absolutely new, there is a great deal in them that explains and completes. Furthermore, they give a good picture of the intellectual growth of the man during nine years of his (perhaps greatest) activity, and certainly during the period of life when youthful ardour and enthusiasm were at their height. The first of these letters was written by Humboldt when he was not yet twenty-nine (in 1798), and in it he advises Professor Pictet of Genoa of his speedy departure for Egypt in company with Lord Bristol, travelling, however, "at my own expense." It is well known how that journey was frustrated by war, and how the project (cherished by Humboldt for many years after) of reaching the East Indies met with its first check. But the letters also show that waiting was for Humboldt no time lost, for he continued his physical studies and experiments wherever he found himself. Analyses of the air, improvement of physical instruments, observations on vegetation, an extensive tour on foot along the Mediterranean and across the Pyrenees to Murcia and Aranjuez, filled up the time. He was greatly disappointed at the failure of his projected journey to India, but made up by the outcome of this pedestrian exploit, which brought him to the Court of Madrid and led to the great exploration of Spanish America, for which the Spanish Government at once furnished every facility and protection. It was at that time that Humboldt became acquainted with Aim   Bonpland, who also had been disappointed in the indefinite delay of the voyage of circumnavigation projected by the French Government. That delay was fortunate, inasmuch as it brought together two men who were so eminently fitted for joint work in the American tropics as the great physicist and the eminent botanist. From that time on Humboldt displays not only a warm admiration for his French associate, but a deep attachment which he kept up during his lifetime and of which his letters furnish abundant proof.

The "American Letters" properly begin with No. XIII (Teneriffe, June 20th, 1799), and thereafter the correspondence bristles with details of Humboldt's activity in research. His allusions to observations and studies in the "field" show that he devoted himself to every branch of science, not only with an enthusiasm that knew no bounds, but with a knowledge and practical sense astonishing in a man of only thirty years of age. It becomes impossible henceforth to follow details—we can but call attention to some points that are more particularly emphasized by the documents.

Perhaps the most insignificant, but still biographically interesting, of these is the gradual improvement of Humboldt in the use of the French idiom. His earlier letters contain orthographic mistakes, little by little these disappear, and a phrase-



ology prevails that approaches more and more nearly to good French, conceived in classical German. It is so difficult, for any one not born to the language, to write it with French intuition. That improvement, however, is certainly due to the long and intimate association with Bonpland. The latter was not proficient in the German language, hence the two companions, for years, had to communicate in French. Both acquired Spanish thoroughly, and Humboldt even asserted that the latter idiom was to him as familiar as his own native tongue, but French remained the medium of understanding for both, and Humboldt profited by it. There cannot be any doubt either that Bonpland exercised a considerable influence on the ideas of Humboldt in regard to the life of vegetable organisms. The former was a strict, severely technical botanist. Humboldt himself was an able adept of botany, he had shown it at an early day in his dissertation on the fossil plants of the carboniferous age. But his admirable essays on the physiognomies of vegetation, on the geographical distribution of plants (*Aspects of Nature*, and notes) prove that his knowledge of structural details of plants greatly improved through Bonpland's patient labours. Only the latter remained strictly technical, whereas Humboldt never lost sight of the vaster perspective, considering each field but as part of a grand *ensemble*, searching for the connection of the life of plants with the life of the animal kingdom, of man and his destinies, of the ocean as well as of the highest mountains. In one of his letters he states (Baron de Forell, XXIV from Caracas, 1800) "man is born to be grateful." That beautiful maxim he followed throughout all his life, and especially towards his companion Bonpland, whose merits he always upheld. In Humboldt's character affection was very salient.

What we have alluded to in the beginning as having been Humboldt's ideal, the establishment of the "Natural Philosophy of the Globe" upon a secure basis, grows during our perusal of these letters, from a timid ideal to a logical system of study. The more he ascertains, the more he connects. And not only terrestrial phenomena—he is carried by degrees to a penetration of the sidereal world, the picture of "Kosmos" as a whole.

While scientific notes (some of which assume the proportion of dissertations) are found in nearly every one of the sixty-three letters, personal experience, adventures, occupy but a limited space; and [then only when they serve to enliven descriptions, the beauty of which foreshadows the "Aspects of Nature." That Humboldt made the entire American journey at his personal expense is well known. When he returned he found his capital decreased to 58,500 thalers, representing an annual income of a little more than 8,550 francs. He expected to have spent all his income and 8,000 thalers of the principal on the American journey, supporting himself and Bonpland out of his own means.

The last eight letters are from Berlin. They begin at the end of 1805, and go to February, 1807. That period must have been particularly trying to one who, like Humboldt, was deeply attached to France, while, on the other hand, he was German, and specifically Prussian, by origin, birth, and duty. Still, not a word of allusion is found in his last letters to the military and political disasters that befell his native country. He certainly was not insensible to them, but he took no active part. Science was his realm. He was then hardly thirty-eight years of age, and in full vigour, which he devoted exclusively to the pursuit of the task he had selected for his life. In later years he became, through his intimate relation with the King of Prussia, connected in a limited way with politics. Of that period and side of his life, the intimate letters to Varnhagen von Ense, published in 1860 by Ludmilla Assing, contain much more information. The "Lettres Américaines" relates ex-

clusively to his scientific career, while throwing interesting side-lights upon his character, his faithfulness to friendship, and his disinterested eagerness to assist any one who proved himself honest in research.

Noteworthy among the pieces of the Appendixes is the one entitled "My Confessions," addressed to Marc Auguste Pictet in the year 1805. It is a brief picture of the writer's early life and scientific career, and contains nothing to recall the common interpretation of the word. These "Confessions" are merely a simple and modest statement of how Humboldt came to be what he was, with tributes of gratitude: first, to his parents, for the very "careful" education they gave him, and afterwards to everyone who befriended him in his early days. The *ego*, not seldom disagreeably prominent in confessions, is here as genuinely noble as in Marcus Aurelius, A. F. B.

**De l'Amazone au Pacifique par la Pampa et les Andes. Par Gaston Donnet.** Vingt-huit Photographies. 310 pp. Paris, Librairie Ch. Delagrave. 1906.

Although quite interesting, this little book need be but cursorily reviewed. The illustrations are poor, and the text of small comparative importance. In matters of history it bristles with errors. Some appreciations are true, however. For instance, that of the government of Chile, portraying it as an oligarchy, which is the fact, and to which Chile owes its strong political and military standing in South America. Mr. Donnet's almost contemptuous treatment of the late Emperor of Brazil and his fall is very much out of place. The Empire, not the Republic, made Brazil what it is, and Pedro II. was not by any means out of date or superannuated, as the author affects to represent him. The Argentine gets off with the very true remark, that it is peopled with all nationalities imaginable, even by Argentines.

Mr. Donnet's descriptions are generally very readable. He has well seen and felt the nature of the countries through which he has travelled. Some of his descriptions of animal life may suffer from exuberance. A. F. B.

**The World of To-Day. A Survey of the Lands and Peoples of the Globe as seen in Travel and Commerce. By A. R. Hope Moncrieff.** Vol. V. viii and 266 pp. Maps and Illustrations. The Gresham Publishing Co., London. 1906.

This fifth volume of the popular work by A. R. Hope Moncrieff deals with South and Central America, Mexico and the Antilles. By "popular" only the style is meant, for there is barely a page of the text that does not bristle with the most unpardonable errors and misstatements. Of course, its spirit is thoroughly British. The illustrations look well, though a number of them are out of date. The text proper is generally unworthy of serious attention.

Even the "Geographical and Commercial Survey" at the end is not free from clumsy mistakes, and in figures. And yet it is the only part of the book that may serve as an excuse for its publication. The diagrams are handy for the cursory reader, and as most of the data are taken from modern statistics, where such are accessible without much painstaking, there is at least an "air" of reliability about them. Altitudes are mostly incorrect, even where positive data exist, but the author only relies upon English information in most cases. Many of his hypsometric data in the Appendix clash glaringly with others given in the text, showing the careless and slovenly way in which the author has performed his task. A. F. B.

**History of the Ohio Canals.**—The history of the development of our transportation would lack an important chapter should it fail to give due prominence to the Ohio canals. They were constructed by the people of that State at a tremendous cost of money, energy and sacrifice, not to reap a direct money return on the investment, but because the canals were needed to provide transportation, stimulate industry, and develop the young State. Two graduates of the Ohio State University, Messrs. C. P. McClelland and C. C. Huntington, have written a complete account of the canals, their origin and construction, the abandonment of some of them, their financial record, and a full statement of the economic value of the canal system to the people of Ohio. The monograph has been approved by the Ohio State Archaeological and Historical Society, Columbus, which has published the book. The book contains 181 pp., with a map of the Ohio canals, and is sold at \$1.10; in paper, 85 cents.

**Mittelmeerbilder. Gesammelte Abhandlungen zur Kunde der Mittelmeerländer. Von Dr. Theobald Fischer.** vi and 480 pp. B. G. Teubner, Leipzig, 1906. (Price, M. 6.)

Many geographers are aware that the special field of study which Dr. Fischer has occupied for the past third of a century has been the Mediterranean lands. He has made at least a score of journeys, long or short, in the countries bordering the Mediterranean from the Bosphorus to the southwest coast of Morocco. This book is a collection of some of the contributions he has made to the knowledge of these lands. The articles appeared in scientific or popular magazines and newspapers and nearly all the descriptions are based upon personal observation. Five of the papers were written within the past five years; the others at intervals between 1870 and 1900. The older papers have been brought up to date in all respects in which they might, in their original form, give erroneous impressions. Five of the papers deal with Constantinople and other parts of the Turkish domain. A fine, condensed description of Palestine, describing, as only a trained geographer may do, the physical features, climate, plant life, population, industrial conditions, and government of the land, fills 80 pages. Italy receives similar treatment in 82 pages, 19 pages are given to the Iberian peninsula, and a series of eight articles on the Atlas lands covers 202 pages or nearly half the book. While the purpose of these writings was to reach a far wider circle than the ranks of geographers may supply, they are the first rate product of a man of science who expresses the hope in his preface that most of them contain much of interest even for the specialist. The book is to be especially commended to those who desire to read a clear and authoritative summing up of the leading characteristics of these various countries.

**Philippine Life in Town and Country.** By James A. Le Roy. x and 311 pp. 16 Illustrations, Map and Index. G. P. Putnam's Sons, New York, 1906.

One of the series of "Our Asiatic Neighbours." The author avoids politics and endeavours to set forth the Filipinos as they are. It is impossible, however, to present the national and tribal aspects of the natives without, at least, grazing the edge of political questions. Mr. Le Roy by the word "Filipinos" means the Christianised inhabitants, who constitute nine-tenths of the total population. To the Filipinos, thus defined, most of the book is given, to the exclusion of the pagan and more or less savage tribes and of the Mohammedan Malays (Moros). In the second chapter, however, he shows the probably close connection of the Moros

and pagans with the Christian Filipinos in their racial origin and insists upon the underlying racial unity of the whole people, excepting none but the Negritos. It might be inferred from the title "Philippine Life" that the book is purely descriptive, but, fortunately, the writer had no merely superficial purpose in view, and the work is not to be classed with the descriptive sketches about the Filipinos of which we have had a surfeit in the past seven years. It deals with the significant facts at the basis of Philippine society and the general movements which make up that society as it now exists. Among the topics are religion, local self-government, education, tribal and geographical influences towards disunion, trade and internal development, the city dwellers and the rural Filipino communities. The illustrations are excellent. Mr. Le Roy's connection for two years with the U. S. Philippine Commission gave him unusual opportunities for study and observation, and his book is suggestive and informing.

**No Man's Land. A History of Spitsbergen from its Discovery in 1596 to the Beginning of the Scientific Exploration of the Country. By Sir Martin Conway.** x and 377 pp. 11 Illustrations, 13 Maps, Index and Appendices. Cambridge University Press, Cambridge, 1906. (Price, 10s. 6d.)

The author appeals to reviewers and readers henceforth to spell the name of this archipelago Spitsbergen instead of Spitzbergen. The name is Dutch, not German, and the spelling with a "z" is a comparatively modern blunder. The fact is, however, that most nations have, for over two centuries, spelled the name with "z" in spite of its Dutch etymology, and there is little probability that an error so long persisted in will be rectified by general consent at this late day.

Sir Martin Conway's book tells the story of events that happened on the shores of Spitzbergen from the discovery of the archipelago by Barents in 1596 down to the era of modern scientific exploration. These Arctic lands, inhospitable as they are, made chapters of history that are uncommonly animated. This region, for generations, was the centre of a large and profitable whale fishery, and bloodshed was often the result of the disputes between rival nations over the fishing grounds. Sir Martin made thorough researches in rare books of old travel to get the material for the narrative, and he has written certainly the most complete account in English of the great industry that added scores of millions of dollars to the wealth of a few European countries. His two journeys of exploration in Spitzbergen gave him personal acquaintance with the region, which has been of great service to him in the interpretation of many of the statements of seventeenth century navigators. Now that Spitzbergen is visited every summer by tourists, the islands are becoming known in wider circles, and this fact gives a special timeliness to this admirable book. Geographers will admire the excellent map of Spitzbergen (without a scale, however,) which Sir Martin compiled for the book. Its value is also enhanced by the author's appendices giving a list of the principal voyages to Spitzbergen, a bibliography of its history and geography, and a critical review of its cartography.

**Stanford's Geological Atlas of Great Britain.** (Based on Reynolds's Geological Atlas.) With Plates of Characteristic Fossils. Preceded by a Description of the Geological Structure of Great Britain and its Counties, by Horace B. Woodward. x and 139 pp. 50 Plates of Maps and Illustrations, and Index. Edward Stanford, London, 1904. (Price, 12s. 6d.)

Those Americans who have an interest in the geology of Great Britain should

know of this book, which is well calculated to enhance their pleasure and information as they travel through the country. It is based upon Reynolds's Geological Atlas, which, for years, was helpful to many who travelled on business or pleasure; but the latest of its editions was published in 1889, and it is therefore out of date. The admirable plan of the older work was adopted for the new book, but the text has been entirely rewritten and enlarged. The descriptions of the geological formations are much fuller than in the earlier book and some new features have been added, such as descriptions of the rock exposures observable along the main lines of railway. Any one with only an amateur's interest in geology will find the book a pleasurable companion.

Mr. Woodward's letterpress opens with a general survey of the geological structure of Great Britain and a list of mineral products and their distribution. This is followed by a succinct account of the geology of each of the counties. Thirty-two pages are devoted to the geological features along the railroads, and the instructive descriptions call the traveller's attention to the way in which the character of the scenery and even of the buildings has been influenced by the changeful geological structure. More than half of the volume is occupied by the county geological maps in colours and sixteen plates of fossils. Geological sections and other illustrations are scattered through the work, and the index makes all information easily accessible.

**Things Indian. Being Discursive Notes on Various Subjects Connected with India.** By William Crooke. xi and 546 pp. and Index. Imported by Charles Scribner's Sons, New York, 1906. (Price, \$3.)

The topics are arranged in alphabetical order. It is the aim of the author to discuss many of the quaint and curious matters connected with India that are not specially considered in the ordinary books of reference, such as amusements, bamboo, carpets, children, dacoity, etiquette, famine, human sacrifice, jewelry, marriage, suttee, and others. Over 160 topics are treated and the copious index makes all the information readily accessible.

In a page and a half given to "Barasaul Guns" the writer says the mysterious sounds heard occasionally in the neighbourhood of Bārāsāl in the Ganges delta, resemble the dull, muffled boom of distant cannon or are like a cannonade between two widely-separated forces. Many explanations of the phenomenon have been suggested, but the question has not yet been definitely decided. On the whole, the wave theory propounded by Mr. Pellew seems best to account for the facts. Mr. Pellew said before the Asiatic Society of Bengal in 1870:

The waves of the length of a mile or so, advancing obliquely from the S.S.W., would break successively on the coast from W. to E. To a person close by the sound of each wave would be somewhat continuous; but to a person forty or fifty miles off, if the waves broke simultaneously, the sound would be a boom like that of a gun, because both extremities of the wave would be at the same distance from the hearer at the centre.

**L'Afrique au Début du XXe Siècle.** Par M. Fallex. vi and 340 pp. 118 Maps and Illustrations. Librairie Ch. Delagrave, Paris, 1906. (Price, 3 fr.)

A superior text-book for the higher geographical classes. Like many French books, it partakes of the nature both of the text-book and the geographical reader. Its geographical quality, accuracy, numerous black maps, and mechanical production, make it desirable not only for the class room and the general reader but also for the tourist. A traveller who desires to have the geographical essence of the region in Africa he may visit in book form, may find it in this little volume

as clearly and as well set forth as in any book on Africa. Each chapter is preceded by a summary giving the essentials of the several topics discussed. The work is marred by comparatively few errors.

**Die Eisenbahnen des Brasilianischen Staates São Paulo. Von Alberto Kuhlmann.** 39 pp. Illustrations and Map. Published by the Author, São Paulo, 1904.

The late Mr. Kuhlmann had special facilities and equipment for giving the history of the development of the railroad system in São Paulo. The pamphlet contains a relief map of the zone between Santos and São Paulo, a considerable number of excellent photographs that help the text, gives a clear insight into the condition of railroad transportation in that region and outlines the future of the industry, as the author believed it would develop in São Paulo. We quote from the work:

No country in the world, excepting the United States, has shown such progress economically, and especially in the sphere of railroads as the State of São Paulo in Brazil. The fact that all these lines, with the exception of two or three, are working profitably, is of the greatest consequence in the development of the railway system, showing, as it does, that it was not purely a speculative enterprise. The immense capital, foreign and domestic, which is sunk in these lines, as well as the almost incalculable material necessary for the construction and working of them, are facts of general interest.

**Geology. By Thomas C. Chamberlin and Rollin D. Salisbury.** Vols. II and III. New York, Henry Holt and Company, 1906.

The scientific public is to be congratulated upon the completion of this masterly treatise upon Geology, which gives in succinct form the principal features of the most advanced thought and the latest investigations in one of the most rapidly developing sciences of the present day. The first volume of this monumental work dealing with geological processes and their results appeared two years ago, and was briefly reviewed in the *BULLETIN* for May, 1904. The second and third volumes treat of the "History of the Earth," the division between the two volumes being at the end of the Permian period, an epoch of the highest importance in the geological history of the earth. When the first volume was issued the authors announced that the work was to be completed in two volumes; the growth of the part devoted to earth history from one volume to two is an indication of the vast amount of material which has been utilized in the treatise.

In the preface the authors state that their effort throughout has been "to keep the discussion as free from technicalities as practicable and to render the matter readable." Technicalities can hardly be avoided in the elaboration of such abstruse and fundamental ideas as are treated in these volumes, but "readable" the whole book certainly is. Clear English, direct statement, distinct separation of theory from fact, abundant illustrations, and many illuminating diagrams and maps combine to make the rather ponderous tomes a constant delight and inspiration to the professional geologist and a necessary handbook to the advanced student. The new geology does not pretend, however, to be a manual; it is rather a discussion of basal principles and of geological formations in their broad characteristics and relations. Details of the geology of particular regions are omitted, except where needed for the comprehension of generalized statements.

The first pages of Volume II plunge the reader at once into the intricacies of expositions of the main theories that have been advanced to account for the origin of the earth and the solar system. After a brief but compendious statement of the still generally accepted so-called "Nebular Hypothesis" of Laplace, together



with proposed modifications bringing it more into accord with modern thought and investigation, and a more extended discussion of the Meteoritic Hypothesis as modified and elaborated by Lockyer and G. H. Darwin, our authors pass on to a succinct elucidation of the Planetesimal Hypothesis, which has gradually been elaborated by Chamberlin during the past ten years or more. Regarding this new theory we can do no better than to quote the summary thereof given by its sponsor (Vol. II, p. 81):

The planetesimal hypothesis thus assumes that the solar system was derived from a nebula of the most common type, the spiral, and that the matter of this parent nebula was in a finely divided solid or liquid state before aggregation, in harmony with the continuous spectra of spiral nebulae. It regards the knots of the nebula as the nuclei of the future planets, and the nebulous haze as matter to be added to these nuclei to form the planets. It assumes that both the knots and the particles of the nebulous haze moved about the central mass in elliptical orbits of considerable, but not excessive, eccentricity. It postulates a simple mode of origin of the nebula connected with the not improbable event of a close approach of the ancestral sun to another large body, but the main hypothesis is not dependent on this postulate.

It assigns the gathering-in of the planetesimals to the crossing of the elliptical orbits in the course of their inevitable shiftings. Out of this process and its antecedents, it develops consistent views of the requisite distribution of mass and momentum, of the spacing out of the planets, of their directions of rotation, of their variations of mass, of their varying densities, and of their peculiarities.

It deduces a relatively slow growth of the earth, with a rising internal temperature developed in the central parts and creeping outward. With such a mode of growth, the stages of the earth's early history necessarily depart widely from those postulated by the Laplacian and meteoritic hypotheses.

Having promulgated the new theory at length, Chamberlin and Salisbury do not seek to explain the history of the earth by it to the exclusion of the consideration of the older theories. On the contrary, in each instance the modified Laplacian hypothesis is cited fairly and the objections to it stated clearly before the accretion (planetesimal) hypothesis is brought forward. The weak places in the new theory, too, where recognized, are stated. Whether the reader accepts the accretion theory or not, he must appreciate the masterly manner in which the authors have stated the difficulties which have been encountered in the application of the gaseo-molten (modified Laplacian) hypothesis. The divergence of the new theory from the old is shown most strikingly in the discussion of the hypothetical stages leading up to the known geological eras and of the partly known Archæan era. The importance of the bearing of the accretion theory is shown further in the discussion of vulcanism (mostly in Volume I), deformation, atmosphere, and climate (including glaciation).

The work lays more stress upon the physical than the palæontological side of the science, *i. e.*, it is a treatise upon geology, not palæontology, and a noteworthy feature is the absence of the long lists of the fossils characterizing the formations which are to be found in nearly all general geologies. Much attention, however, is paid to the question of the rise, distribution, and disappearance of one fauna and flora after another and to the consideration of the causes leading to these changes in the life upon the earth. North America is taken as representative of the whole earth, and comparatively little is said about the geology of the other continents. These two volumes, therefore, give "a connected and interpretative sketch" of the earth, as illustrated particularly by this continent. Throughout the work stress is laid, as far as knowledge warrants, upon the surface features of the progressive stages of the land and upon the permanence of the continents. In this connection mention should be made of the series of maps showing the continent of North America in the successive periods, because they represent not only the present surface distribution of the rocks of the period, but



also the probable concealed extension of the beds beneath later formations, the degree of probability being indicated by shading. A sufficient number of excellent figures illustrates the characteristic fossils (*Leitfossilien*) of the formations, without going far into the details of species. An important feature of the work is the general geological map of the United States and part of Canada compiled by Mr. Bailey Willis with the aid of geologists of the U. S. Geological Survey. Such a compilation had not been made before in twenty years, during which period enormous strides had of course been made in the knowledge of the geology of many parts of the country. The map bears the date of 1903.

In the arrangement of the subdivisions of the geological scale some changes have been introduced which will at once attract the attention of the reader who is familiar with the older textbooks and manuals. The term *Proterozoic*, originally proposed by R. D. Irving, is revived and given equal rank with *Paleozoic* in the time scale. It has the same meaning as the *Algonkian* of the U. S. Geological Survey, and comprises the *Huronian*, *Animikean*, and *Keweenawan*, covering the interval between the *Archeozoic* (*Archean*) and the *Paleozoic*. Williams's names *Mississippian* and *Pennsylvanian* are adopted for the *Subcarboniferous* and *Coal Measures* respectively, while Hill's name *Comanche* is used for the *Lower Cretaceous* of authors, and the term *Cretaceous* is restricted to the *Later*, or *Upper*, *Cretaceous* of previous treatises. Contrary to the law of priority and the usage of Dana, Geikie, and other authorities (except de Lapparent), Lapworth's name *Ordovician* is used for the *Lower Silurian* of Murchison. This use of the term *Ordovician* is spreading in the United States, but it works great injustice to the labours of Sir R. Murchison, and is to be deprecated.

A noteworthy and valuable feature of the stratigraphical portion of the work is the publication in tabulated form of the geological sections in several typical areas of the country. The sections which are given in connection with several of the great periods are supplemented in the Appendix by twenty-two sections for the entire geological scale as represented in as many parts of the United States from Massachusetts to Florida. These are conveniently presented for ready reference.

As was to have been expected from the character of most of the field work of both authors, much stress has been laid upon the subject of glaciation in all its bearings. Boulder-bearing beds containing striated stones have been found in Norway and in China, which indicate the occurrence of extensive glaciation during the opening stages of the *Paleozoic* previous to the undoubted *Cambrian*. The chief ancient glacial period, however, was at the close of the *Permian* in England, South Africa, India, and Australia, and new illustrations from South Africa are published. The fact is brought out that this *Permian* or *Permo-Carboniferous* glacial period affected a much larger area than was covered by ice during the *Pleistocene* glacial period, and its distribution was equatorial rather than circumpolar, like the *Pleistocene* glaciation. This localization of the glaciers is considered to be the most puzzling feature of the whole problem, and the explanation of it is thought probably to lie in the great late *Paleozoic* development of the land connection from South America *via* Antarctica to New Zealand and thence to Australia and India, which concentrated warm waters in the Pacific and cold waters in the Indian Ocean and produced profound climatic changes. At the same time a broad tongue of the Arctic sea is supposed to have occupied eastern Russia and western Turkestan, co-operating with the peculiar conditions in the southern hemisphere to produce refrigeration in low latitudes.

Limitations of space forbid our reviewing in detail all the features of this great work, and we pass over almost in silence the discussion of Mesozoic and Cenozoic time, with its abundant reference to the labours of the vertebrate palaeontologists, which have added so extensively to our conceptions of physiographic and climatic conditions in western America as well as to our knowledge of the animal forms peopling the continental land surfaces. The probability, too, is admitted that many beds formerly assigned to great Tertiary lakes are of æolian or sub-ærial origin and that lakes were incidents rather than characteristics of Tertiary time.

Turning to the Pleistocene, or Glacial, period, many of the younger readers of this book will be surprised at the marshalling of facts to prove the glacial origin of the great deposits of clay, sand, and boulders which we know as "Drift" and which cover half the plains of North America and vast areas in Eurasia, so generally accepted at the present day is the fact of extensive glaciation in the northern hemisphere in recent geological time. Six invasions of the great ice sheet are recognized; but they were of unequal extent and duration, and were separated by unequal intervals of time, and consequent recession. The stages are, beginning with the earliest: (1) Sub-Aftonian, or Jerseyan, (2) Kansan, (3) Illinoian, (4) Iowan, (5) Early Wisconsin, (6) Late Wisconsin.

The æolian origin of the Löss is held to be most probable, the material being considered to have come from river bars and flats exposed in times of low water and from the rock-flour brought down by the continental ice sheets. The evidence for the appearance of man in North America before the final retreat of the continental ice sheets is thought to be sufficient.

The theories which have been advanced to account for the Glacial period are (1) the hypsometric hypotheses, or those appearing to elevation of the land, (2) the astronomic hypotheses, such as variations in the eccentricity of the earth's orbit and the wandering of the earth's axis of rotation, (3) the atmospheric hypotheses, or those which appeal to changes in the constitution or movements of the air. Reasons are given for discarding the first two groups of hypotheses, and then the arguments in favour of the third are brought forward at some length.

Our authors consider that the general conditions favourable to glaciation were supplied by the extensive deformation of the land which took place at the close of the Pliocene period, resulting in great changes in the circulation of oceanic currents, in the acceleration of the vertical circulation of the atmosphere, and in the reduction of the average temperature of the atmosphere by a depletion of moisture and carbon dioxide. The localization of the glaciation is assigned to the two great areas of permanent atmospheric depression that have their present centres near Greenland and the Aleutian Islands respectively, and which may be presumed to have been extended and intensified during the glacial stages. The explanation of the periodicity of glaciation is based upon the conception that under conditions favorable for glaciation certain of the agencies involved became dominant and tended to intensify and accelerate glaciation for a time, until they either pushed the effects to an extreme from which a reaction was inevitable, or they exhausted themselves temporarily, while other agencies of opposite phase, which had been subordinate until then, became dominant and forced a reaction.

Each volume is supplied with a copious index besides a full table of contents, the index to Volume III being general for the whole work.

E. O. H.

his  
nd  
n-  
nic  
he  
is  
of  
er-

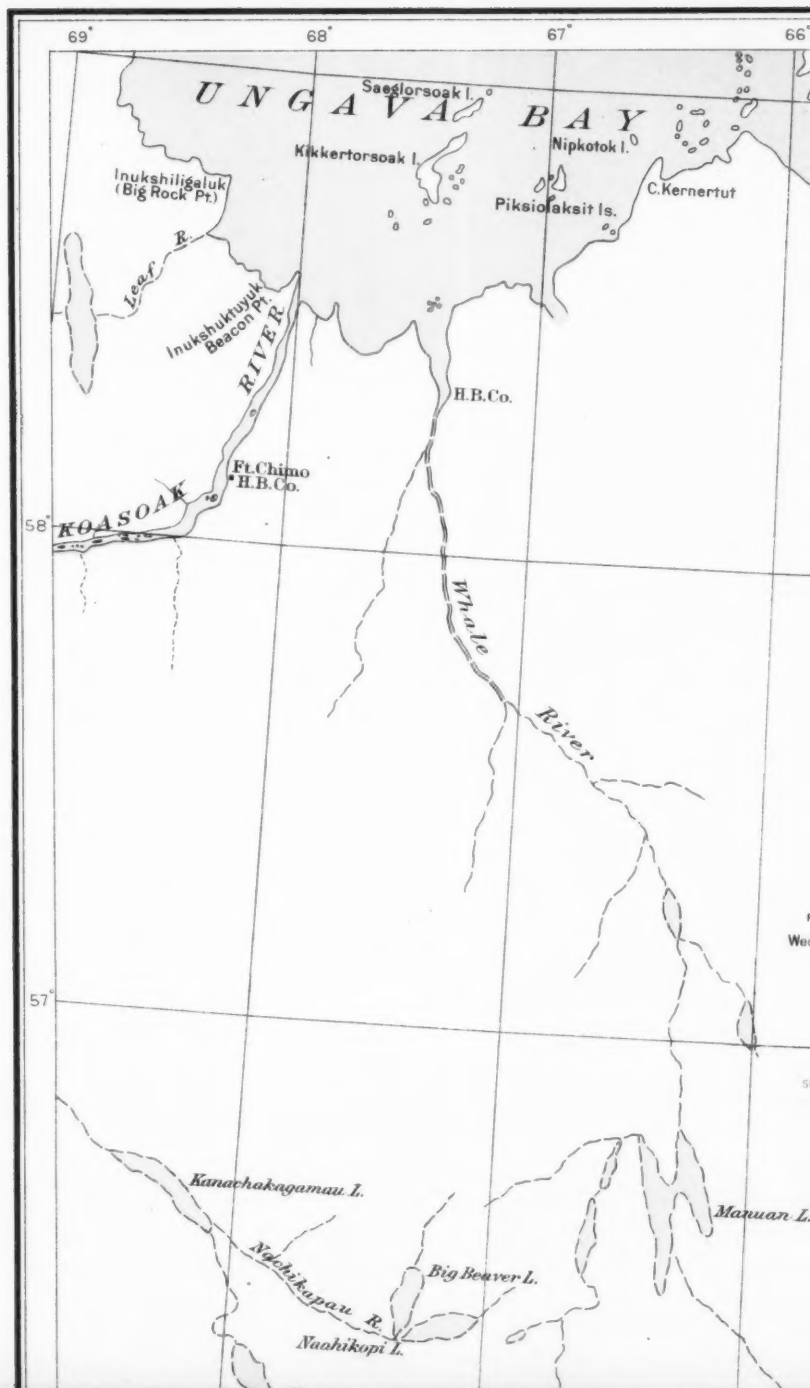
era  
ial  
as  
in  
ia-  
the  
nd  
The  
n-

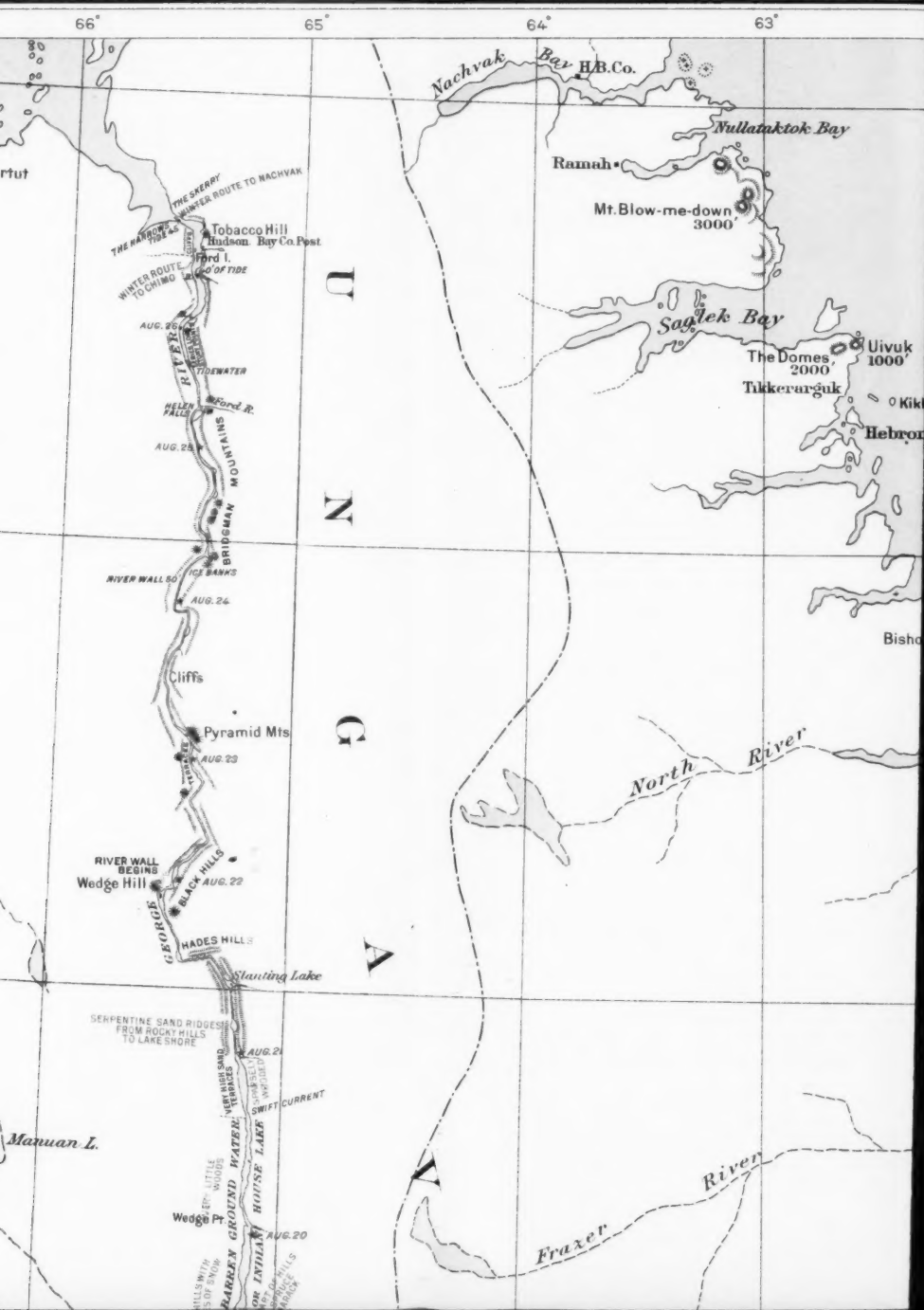
ng  
ter  
nce  
on-

are  
(2)  
h's  
tric  
of  
and

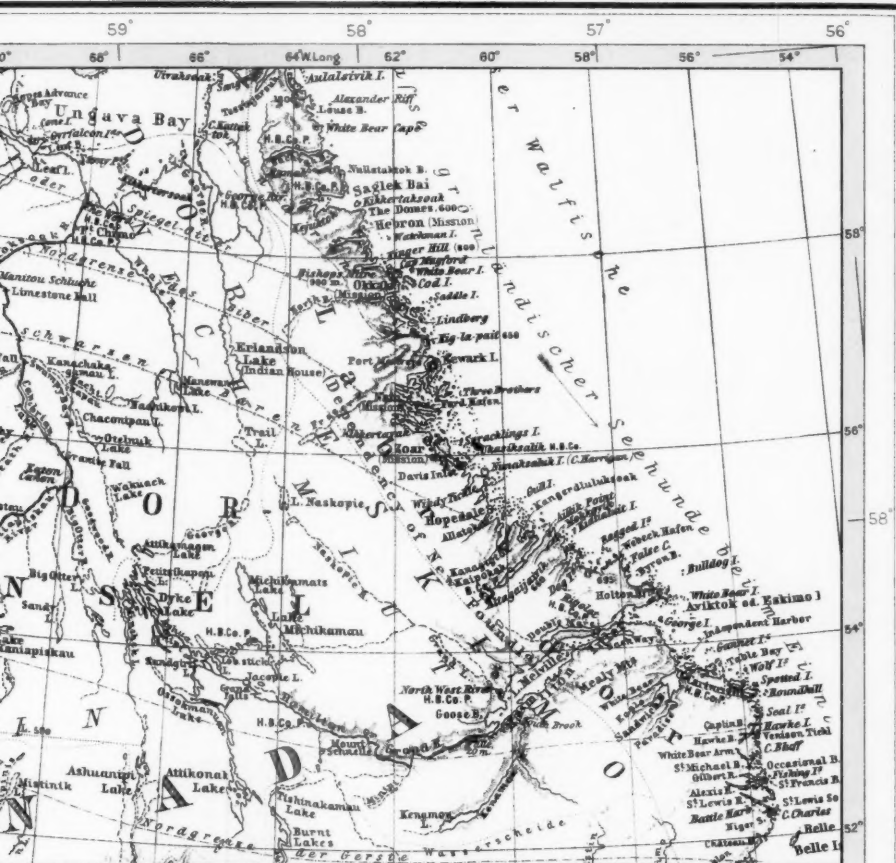
ere  
ose  
ric  
in  
of  
the  
ent  
be  
The  
that  
and  
n ex-  
ther  
a re-

ents,  
I.









NASCAUPÉE AND GEORGE RIVERS AS THEY APPEARED ON MAPS IN 1905  
(FROM STIELER'S HAND-ATLAS)

SCALE: 1:7,500,000 or 118.8 statute miles to an inch

0 25 50 75 100 miles

## MAP OF EASTERN LABRADOR

Showing Grand Lake and the courses of the Nascaupée and  
George Rivers as surveyed and mapped,  
June 27 to August 27, 1905

BY

MRS. LEONIDAS HUBBARD, Jr.

WITH THE



57°

RIVER BE  
Wedge H

SERPEN  
FR

Kanachakagama L.

Maruan L.

Ngechikapau R.

Big Beaver L.

Nuachikopi L.

Chaconipau L.

56°

Otelnuuk L.

Baden Canon

Goodwood River

Wakuach L.

Sandy River

Big

Otter River

55°

Attikamagen L.

H.B.Co.  
Abandoned

Pettisycapau L.

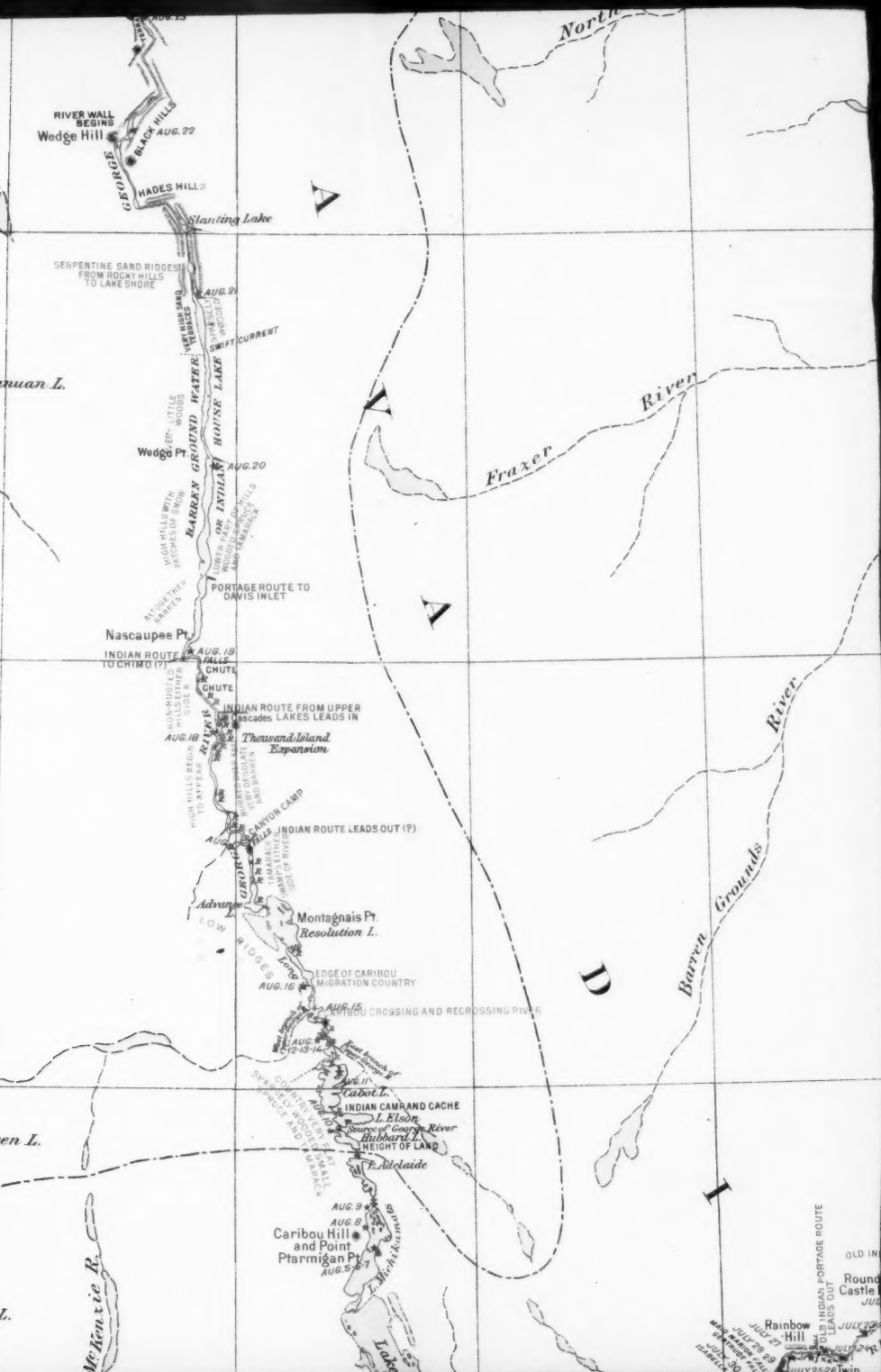
Big Otter L.

Astray L.

Dyke L.

Marble

McKenzie R.



OLD IN  
Round  
Castle  
JUL  
JULY 22  
JULY 23  
JULY 24  
JULY 25  
JULY 26  
JULY 27  
JULY 28  
JULY 29  
JULY 30  
JULY 31





NASCAUPEE AND GEORGE RIVERS AS THEY APPEARED ON MAPS IN 1905  
(FROM STIELER'S HAND-ATLAS)

SCALE: 1:7,500,000 or 118.3 statute miles to an inch

0 25 50 75 100 miles

## MAP OF EASTERN LABRADOR

Showing Grand Lake and the courses of the Nascaupée and  
George Rivers as surveyed and mapped,  
June 27 to August 27, 1905

BY

MRS. LEONIDAS HUBBARD, Jr.

WITH THE

SUSAN AND BIG RIVERS

Showing the route of Mr. Leonidas Hubbard, Jr.  
in the Summer of 1903

SCALE: 1:1,584,000 or 25 statute miles to an inch

0 25 50 75 miles

*Mrs. Hubbard's journey was made in canoes except at the  
land portages indicated*

CAMPS, - \*

PORTAGES, —

RAPIDS, - R



